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approach

THE NAVAL AVIATION SAFETY REVIEW

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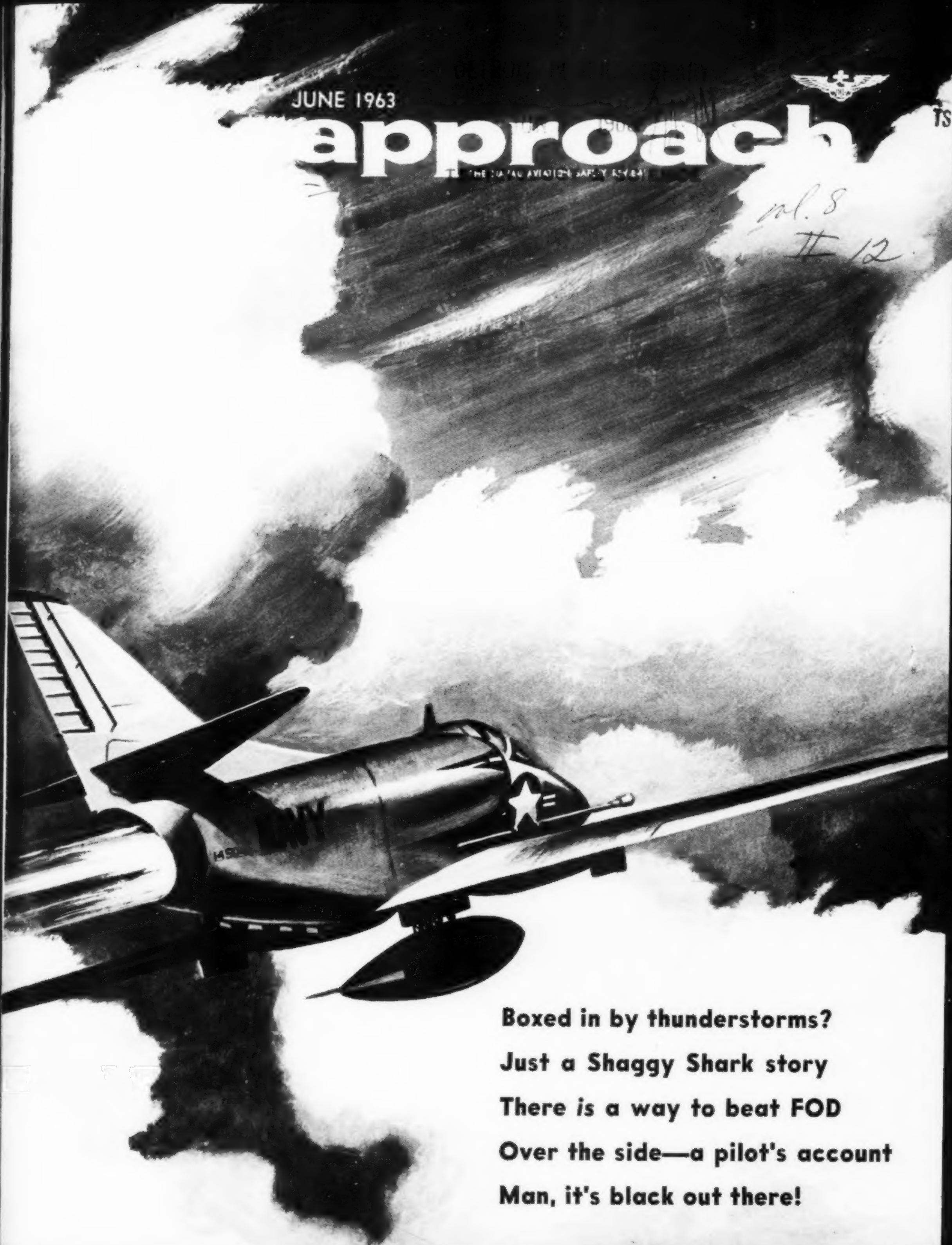


Boxed in by thunderstorms?

Just a Shaggy Shark story

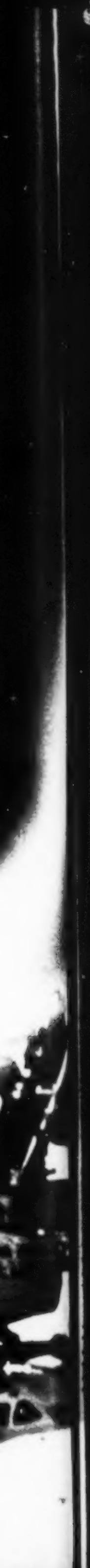
There *is* a way to beat FOD

Over the side—a pilot's account

Man, it's black out there!

Night carrier operations account for a

2102.1 This is Tiger One, speed brakes now.
2102.3 Tiger One departing marshall with two. Tiger Two has no TACAN.
2102.7 This is Tiger One, what is the final bearing?
2102.8 (Controller) Expected final approach bearing is 010, over.
2102.9 Tiger One roger 010.
2103.4 Tiger One and Tiger Two this is control, squawk 3-62. Correction, squawk 2 in your descent.
2103.5 Tiger One squawking 2.
2103.6 Tiger Two squawking 2.
2105.4 (Controller) Tiger One I hold you at twenty-one miles.
2105.5 Tiger One concur.
2105.7 This is control, final approach bearing now 007.
2107.0 This is Tiger One; Platform.
2107.1 (Controller) Roger Tiger One. Come right 20.
2107.2 (Tiger One) Roger right 20.
2109.3 Tiger One is at Gate One. Brakes in, Two.
2110.4 Tiger One, Gate Two, heading 020, state 24.
2110.5 (Controller) Roger Tiger One. Right thirty.
2110.8 (Controller) Tiger One and Two right thirty more for separation. I'll carry you across the centerline then back to it.
2110.9 (Tiger One very questioningly) Understand right thirty?
2111.0 (Controller) That is affirmative.
2111.2 (Tiger Two) How about adding a few knots, Tiger One? I'm indicating 120.
2111.3 (Tiger One) Right. I've got 130.
2111.9 Tiger One this is control, descend to and maintain 600 feet.
2112.0 Roger, descend to 600 feet.
2112.2 (Controller) Tiger One what heading?
2112.3 Tiger One 010/600'.
2112.4 (Controller) Tiger One left to 355.
2112.5 (Tiger One) Left 355.
2112.9 (Controller) Tiger Flight check your gear, hook, and flaps.



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good share of our aircraft accidents. This episode is typical of most of them.

2113.0 Tiger Two Roger. I have the ship in sight now.
2113.5 (Tiger One) Do you have the meatball yet, Tiger Two?
2113.6 (Tiger Two) I have the ship in sight but I miss—(Sounded as though he started to say something then changed his mind). Have I been detached?
2113.7 (Tiger One) A little bit high now.
2113.8 (Controller) Tiger Two you are lined up right.
2114.0 (The following transmissions were broadcast simultaneously by the two aircraft). Tiger One in the groove, no meatball.
This is Tiger Two, am I cleared to make an approach, over?
2114.1 (LSO) PULL UP, PULL UP, WAVE OFF, WAVE OFF, PULL UP!!
2114.2 (Controller) Tiger One and Two wave off, climb to 1500 feet, enter the wave off pattern.
2114.7 (Controller) Tiger One radio check.
2114.7 Tiger One loud and clear.
2114.8 (Controller) Tiger Two radio check.
2114.9 Tiger Two this is Tiger One radio check.
2115.4 (Controller) Tiger One cleared downwind heading 190.
2115.7 Tiger Two, Tiger One radio check.
2115.8 This is Tiger One, unable to read Tiger Two.
2116.0 (Controller) Tiger One report abeam.
2116.1 This is Tiger One abeam. Do you have contact with Tiger Two, over?
2117.2 (Controller) Tiger One, left to final bearing 007.
2119.1 Tiger One, Control; I have an aircraft off your right wing at one-half mile, easy right, distance is opening.
2121.1 (Controller) Tiger One, what is your position?
2121.3 Tiger One Control, What is your position?
2121.6 (Controller) Tiger One radio check.
2121.8 Tiger One Control—

Night Fright

Most people would describe that fatal night as a dark but good night. Experienced and currently qualified night carrier pilots would describe it as a "Blackie," meaning that it was a night when they were more susceptible to vertigo, and one that required meticulous attention and concentration on instrument flying. Certainly not the roughest night of their careers but one of those black nights in which professional attention to detail, particularly during the transition phase from instruments to visual reference, was mandatory.

This accident, though a double tragedy, is typical of most night carrier accidents. The approach was perfectly normal until fairly close in (within Gate One). From this point on the lead pilot began to question the directions of CCA and an element of doubt entered his mind as to whether or not he would be able to lead his wingman to the proper position to pick up the meatball. With this thought pressing, he shifted from instruments to visual flight while still considerably off final bearing. This deviation greatly multiplied the problem of making the approach. Not only must he establish a glide slope but he must also obtain line-up. At this point disorienta-

by LT. G.W. Lubbers

tion and possibly optical illusions occurred and thinking he was high the leader started a descent without having the meatball in sight.

It might be said that these two pilots made fatal mistakes in deviating from SOP, but for two of the most experienced pilots in the squadron to do this leaves a question that must be answered as soon as possible in order to prevent possible recurrence of similar accidents.

Night carrier operations are, have been, and probably will account for an alarmingly high percent of the Navy's aircraft accidents unless immediate steps are taken to remedy existing conditions. In these days of technological advances, we are rapidly approaching that sought after stage in aviation when "look Ma, no hands," is the byword for carrier approaches and landings. But meanwhile, "back at the ranch" or perhaps we should say, "back at the carrier," we are still operating multimillion dollar, supersonic iron birds with antique procedures and equipment.

Statistics for fiscal years 59-62 show that approximately one-third of all Navy fixed wing aircraft accidents occur while embarked. Of this percent, 37.4% occur at night. Offhand this may not appear to be an alarming percentage but if related to hours of training the figures take on a different meaning. Approximately 1900 day embarked hours are flown per accident as compared to 775 night embarked hours per accident. If these percentages had been expressed in yankee dollars the figures would take on astronomical proportions. Even though strenuous efforts have been and are being made to reduce this percentage, the rate still remains fairly constant.

All too frequently accident reports and endorsements have noted and discussed the fact that pilots do not get an adequate amount of night flying time. Most of the flying prior to deployment and all shore based flying while deployed is usually controlled and scheduled by the squadron and air group commanders. In many instances the amount of time devoted to night flying is alarmingly small and usually consists of several night bounce periods prior to deployment.

A survey of night carrier accidents covering a four year period, with the pilot as the contributing cause factor, will serve to emphasize the seriousness of this problem.

Instrument Hours Flown During *90 Days Preceding Accident*	*Number of Accidents*
0-5	73
6-10	51
11-15	36
15-20	11

Night Hours Flown During *90 Days Preceding Accident*	*Number of Accidents*
0-5	42
6-10	35
11-15	40
16-20	27

Proficiency—a difficult must

With long in-port periods, or when hazardous operating conditions at sea exist, it is difficult, to say the least, to keep air group pilots night carrier qualified. In many instances the bare minimums of proficiency aren't maintained. Pilots are fortunate if they can average three or four night landings per month. This is far from the seven or eight night landings per month which many experienced pilots consider to be the optimum for remaining proficient.

Considering the relationship of recent flight experience to accidents, deployed carrier squadrons frequently find themselves facing full scale day and night operations their first day out of port. Cases are not uncommon when a carrier will launch only one or two day cycles before a full night schedule. In these cases a pilot is indeed fortunate if he even gets one day landing before being shot off into the ink bottle. Sometimes the extended periods of layoff are akin to the holiday layoffs experienced while shore based. After these layoffs incurred ashore, all squadrons are urged by higher authority to begin operations cautiously. After an extended in-port period, a cautious start would seem even more warranted for carrier operations.

Night and Instrument Time Vital

The hard facts of night carrier work are that almost all flights are actual instrument flights. Recent instrument practice becomes extremely important but oftentimes difficult to obtain except during the night hops themselves.

Opinions range about 50-50 as to which is more hairy, the night cat shot or the night approach, but in either case the pilot finds himself in the worst instrument flying situation possible. On a cat shot the pilot must rely on the gauges without first getting the feel of the plane and instruments. During the approach the pilot must transition from penetration speed to final approach speed in rather close proximity to the water, usually 1000 feet. This transition is usually completed near the initial altitude ($\pm500'$) and then, until reaching approximately 1 mile astern, the pilot is forced to fly partial instruments and partial visual contact while attempting to lineup and acquire the "meatball."

Every known safety agency will brand this procedure as an unsafe practice and yet the carrier pilot has no alternative and recognizes this as SOP. Needless to say, these phases of flight require the utmost of instrument confidence and a well developed scan pattern.

Standardizing CCA and Communications

In the past most carriers had their own form of CCA approach. These approaches were usually joint concoctions of the air group and CIC and were frequently revised so often that the parent air group found it hard to make consistently good approaches, let alone some stray throttle jockey shooting the approach for the first time.

Of course the old problem of poor communications is still with us and seems to be one of the major obstacles toward good night recoveries. Current operating equipment and procedures dictate that the CCA controller transmit to three or more aircraft on one frequency during the approach. This becomes confusing to the controller as well as the pilot. Each pilot hears a constant transmission similar to the following: "Sunglass 610 steer 345 - 602 come left to 360 - 600 turn to final bearing 355—etc., etc." Include a couple of garbled transmissions and you really have a can of worms.

One Minute Intervals Necessary

Another finger in the pie is that the skipper still likes to see a one minute landing interval. This is one-third the interval established as a safe landing interval at shore stations during instrument conditions, where more and better equipment is available. Of course, this is an unescapable necessity in wartime, since a carrier is more vulnerable while recovering aircraft, and practice should be directed toward attaining this interval.

The radar currently in use is somewhat improved from that used a decade ago but still leaves much to be desired. Tracking in some instances is less than positive and glide path information is nonexistent. The pilot is worse off than if he were making an ASR approach to a field and he's doing it to much lower minimums, in some cases.

Add to these problems an average portion of the self-preservation instinct, multiply by a bit more than the usual amount of anxiety and the product is an aviator what am busier than a one armed paperhanger on a shaky ladder.

What are the Answers?

Now you have some of the problems. What are the answers?

Much has been and is being done to reduce the risk of night carrier aviation. Some areas of development concerned are:

1. Improved and standardized operating procedures. These include both pilot and shipboard procedures.
2. Improved deck lighting.

3. Improved landing aids and landing aid systems.

Over the past several years there has been an increasing trend toward standardization. It started with the pilot and has spread to include almost all facets of aviation. The CCA procedures finally succumbed to the tide of standardization last year when a joint AirLant/AirPac Instruction P3710.16E was issued. Even though this instruction has been in the fleet a year I would venture to say that no two carriers have the same identical CCA pattern. Although the problem of cross deck operations doesn't occur too often, an unforeseen emergency may necessitate an exchange of aircraft in which event complete standardization would eliminate needless problems, and anxious moments could be avoided.

I'm sure that if any heads-up naval aviator wanted to get aboard a strange carrier he could hack the minor differences in CCA patterns. The problem is not in flying the pattern but that attention and concentration, so vitally needed to make a successful night landing, are diverted to flying a strange pattern or making a different voice transmission. It doesn't take much of a difference at the right moment to cause a distraction which may make the pilot forget to lower the wheels or slip a couple of hundred feet in altitude.

Maintain Confidence

An item often overlooked in pilot-controller relations is confidence. Several accident reports mention that the pilot lost faith in the abilities of the controller to bring him safely to a position where the meatball could be picked up. When this doubt is allowed to lead to the decision to disregard instructions of the controller a possible hazard is in the making. Of course, it goes without saying that this confidence must be mutually earned and maintained by the controller and the pilot.

At present there doesn't seem to be any relief from the non-existent radar glide slope situation. It looks as if the meatball will be around for several more years as the sole means of glide path information. Development and testing of the SPN-10 is still underway. An installation of this gear is being performed on one Forrestal and one Midway class carrier and should be ready for fleet testing later this year. The AN/ASW-21 Data Link is being installed in one F-4B (F4H-1) along with an automatic power compensator (APC) system. The system should be ready for test this summer along with the SPN-10 gear.

(For you readers not acquainted with the gear, the SPN-10 and AN/ASW-21 equipment are the black boxes currently under development for the automatic landing system.)

Better Communications

Communications is still the big bug in CCA recoveries. It's hard to say whether this fly in the ointment is due to lack of proper equipment or antiquated procedures. With the advent of multichannel UHF it certainly seems unnecessary to have three or four aircraft being worked on final on the same frequency. It seems to me that a procedure could be established whereby the pilot could be switched to an individual frequency before leaving marshall which would allow him uninterrupted communications with the CCA controller and the LSO. I'll admit that it will take more equipment than is currently on hand in CCA but the equipment is available.

Some argument may be raised that 14 to 18 aircraft per recovery necessitates too much frequency changing on the part of the controllers and LSO. It might also be said that chances of a communications mixup or lost communications are increased.

In rebuttal I say, "Hog wash." Predetermined frequency plans can be established and published to each squadron during the prelaunch briefing. To simplify changing frequencies on the part of shipboard personnel, the use of closely related frequencies such as 320.2, 320.4, 320.6, etc., can be used. In the event of a foul up the old standby "GUARD" is always available. At any rate I believe the advantages far outweigh the disadvantages.

Well, enough discussion on CCA. I'm sure that if air group operations officers and CIC officers bumped heads with the mutual intent of developing sound simplified communication procedures that far better procedures would be devised than those now in use.

Improving Deck Lighting

Deck lighting is another item that invariably enters into any discussion on night CV operations. I feel certain that COD pilots, as well as anyone else who lands on several different decks, will verify that deck lighting plays a significant role in night landings. The portrayal of the landing area can give you the impression of being either high or low depending on the spacing and amount of toe-in of the landing area lights. Of course this optical illusion is easily overcome after several flights from the same deck and shouldn't pose any problem if you're truly flying the meatball. Opinions as to type and amount of lighting vary almost to the individual. One extreme being the use of only one row of center lights, the other being the flooding of the entire ship as well as a portion of the surrounding H_2O.

The most recent and certainly most welcome development to deck lighting is the red flood light system.

It has no adverse effects on the pilot coming aboard yet aids tremendously the problem of taxiing and flight deck handling. There's been many a pilot who has come aboard safely only to get vertigo while taxiing up a dark deck.

What About Landing Aids?

Lately landing aids and landing aid systems seem to be occupying most of the attention of designers and developers. New systems and ideas seem to be springing up overnight. One of the major problems in flying and in landing aircraft, is that the pilot has to assimilate and interpret information from two sources. One of these sources is the normal instrument information giving altitude, speed, heading, etc. The other is the obvious one of just looking out through the windscreen to check the aircraft's position relative to the ship. By their very nature these two information sources are mutually exclusive, that is, only instrument information or outside world information can be assimilated by the pilot at any one time.

The major disadvantage associated with these two distinct information sources is the time taken for the pilot to re-accommodate his visual and mental processes after a change from one to the other. This time, known as the transition period, assumes major importance when the pilot is about to come aboard. In this critical period the pilot has to fly on instruments to obtain altitude, attitude, and power information and visually to obtain glide path and line-up information. At some point near the end of his approach he has to rely solely on visual information and it's a fact that the accident rate of landing aircraft is at a maximum during this transition period.

Several interesting systems have been devised to overcome this problem. One system which seems to be doing quite well is of British origin. Called the Pilot's Electronic Eye-Level Presentation System (P.E.E.P.), this system, through the use of transistorized electronics and an optical arrangement, can portray all necessary landing information on the windscreen or a fixed glass similar to the gun sight. The British have tested and evaluated the system both by simulator techniques and actual flight trials, and experimental and production units are now being manufactured.

Training is the Clue

Unfortunately, improved hardware is not the whole answer to night carrier operations. No matter how good the equipment, a lack of proficiency in use of the equipment will still lead to trouble. This leads us right back to the old plague of training. It would be foolhardy to assume that modern equipment could ever replace the need for adequate training. The only way to maintain proficiency in the use of your bird is to use it. The prime purpose for the development of new and better landing aids and systems is simply to make your training safer.

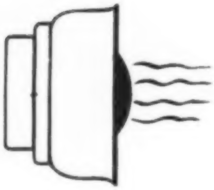
It is realized that funds and equipment for training can only be stretched so far but every effort must be made to stretch them in the right direction. You certainly wouldn't expect to consistently score E's in bombing or air to air gunnery if you didn't practice consistently. Why then should you expect to make good night carrier landings if you don't practice? Both feats certainly require an equal amount of precision and practice.

I realize night flying on the beach is not the most desirable thing to do, especially just after completing a deployment but every advantage should be taken of the small amount of time available on the beach. Maximum effort should be made to get both night time and instrument time. Why hold foul weather lectures on rainy days when the best lessons can be learned from an actual instrument hop?

An excellent idea, recently suggested, would be to establish a CCA pattern to a mirror equipped runway and brief GCA controllers on CCA procedures so that they could be practiced while disembarked. The idea seems quite feasible and should be able to be worked out without too much difficulty. Couple this with more than the usual two or three bounce hops before deployment and night readiness should increase markedly.

If you're dead set against night flying on the beach or don't feel strongly for pushing the subject the Navy has come up with a new training device. It's called Flight Training Device 2H53 and is manufactured by Dalto Electronics Corporation of Norwood, New Jersey. This device is used in conjunction with present Navy flight simulators and offers training for both carrier and field landing practice. When coupled to a type Operational Flight Trainer this device should present very realistic night and/or instrument carrier landing practice.

There is no magic formula for 100% safe night carrier operations. The problem has been with us a long time. We have come a long way in the development of both equipment and operating procedures but we still have a long way to go. The development of new equipment is slow and costly. The immediate solution to the problem lies in the training. It's like an old coach of mine once said, "There are two ways to keep from losing the game, practice until you're good enough to win or don't play." ●



from the Air Boss

Firing No-Loads

The dangers involved when the catapults were firing no-loads were discussed. Personnel will continue to be warned over the bullhorn and instructed to *never* step on a catapult track, blast deflector or to walk near the elevators when it can be avoided—*USS* INDEPENDENCE

Hot Lines

Inability to de-energize electrical power cables at cable source on flight and hangar decks could be a source of electrical fire damage, source of ignition of fuels near fueling stations and severe personnel injury. An alteration has been approved by BuShips for accomplishment during the next yard availability. Safety requires higher priority. Attempt will be made to enlist the aid of the Type Commander in raising the priority to permit early incorporation.—*USS* CONSTELLATION

Non-Standard Taxi Signals

SEVERAL pilots have recently complained that non-standard taxi signals have been used by taxi signalmen on the flight deck.

It is realized that the education of taxi signalmen is a continuing process and that the Flight Deck Officer must be informed as soon as possible of any non-standard taxi signals received. These inputs must come from the pilots, and all Operations Officers have reminded their squadron that all instances of non-standard taxi signals must be brought to the attention of the Flight Deck Officer with specific details as to which signalman used what signal incorrectly.—*USS* FORRESTAL

Warning Sign

In the future, Dud aircraft with bad brakes will have a sign indicating same displayed on outside of aircraft.—*USS* INDEPENDENCE

Complacency Around Propellers

Discussion. The smaller number of propeller aircraft on the ship often results in personnel becoming careless of the dangers of rotating propellers. Two cases were observed of plane pushers almost walking into whirling propellers. In one case a man was observed trying to squeeze between an A-1 (AD) drop tank and the rotating propeller. Since this ship has not had an accident of this type, many of the less experienced men on the flight deck are fearless of propellers.

Action. All squadron Commanding Officers and the Air Officer conduct a campaign to increase the awareness of propeller dangers. By bringing to everyones attention evidence of other ships accidents involving personnel and propellers, the fear level will be raised to the point that personnel will stay well clear.—*USS* ENTERPRISE

MAD Boom Attention

RECENTLY there have been reported several S-2D (S2F-3) incidents of elevator controls jamming when the MAD boom was extended. VS-35 reports experience with this dilemma resulted in nearly complete elevator jamming, in a slightly nose-down attitude, when during extension the MAD boom cables became entangled with the elevator cables. The boom could not be retracted without resultant adverse elevator problems and possible severing of the cables.

Excellent airmanship on the part of the pilot using the elevator tab enabled landing characteristics to be checked and a subsequent arrested landing effected without damage to the MAD boom. Inspection revealed the need for a more frequent inspection and lubrication of the boom channels. VS-35 submitted a safety of flight and an interim fix recommendation to ComNavAirPac until such time as a permanent fix is directed by BuWeps.—*USS* HORNET

Whadesay?

The terms "Clara" and "Bolter" were discussed. The LSO stated the transmission "Clara" was easily understood while "No Meatball" sometimes left room for doubt, particularly if the first part of the transmission was blocked out. In the past both Pri-Fly and the LSO transmitted "Bolter" when an aircraft failed to be arrested. Occasionally one transmission blocked the other, therefore it was agreed the LSO would initiate this transmission in the future.—*USS* INDEPENDENCE

SH-3A (HSS-2) Night Rescue Vehicle

THE Operations Officer expressed his enthusiasm for the capability of the SH-3A (HSS-2) as a night rescue vehicle, and cited the night rescue of an A-1 (AD) pilot which was effected within nine minutes during carquals. The Commanding Officer of HS-3 stated that during night operations one of his aircraft could effectively take rescue station during launches and recoveries, and still perform his assigned mission. He further stated that he had always believed that the SH-3A (HSS-2) could be very effective as a night rescue vehicle, and the incident of the A-1 (AD) pilot rescue had justified this belief.—*USS* INTREPID

Med Airways

Assistant CATC Officer gave a briefing on the many airways that crisscross the Med areas. A chart will be kept up to date and displayed in Air Operations.—*USS* INDEPENDENCE

Clear the Decks

Last month's report was concerned with what was considered an excessive number of personnel on the flight deck forward during night recoveries. It was recommended that the side number of the approaching aircraft be announced over the 5MC. This has been done and it has reduced the number of people forward on the flight deck. It also has eliminated the red flashlight shining the pilot's eyes as the captain searches for "his" side number. It was recommended that this procedure be adopted as standard. Instruction on this procedure should be given plane captains by squadron and detachment line officers in order to place more plane captains in the catwalks and less on the flight deck.—*USS* FORRESTAL

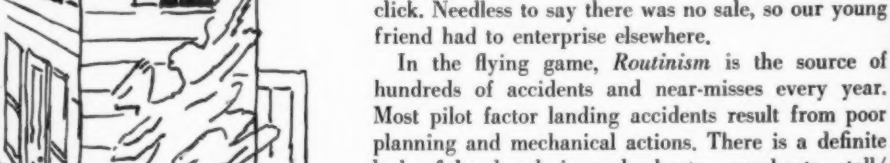
The PITFALLS o

Routine can be defined as regular, unvarying, or mechanical procedure. It has its place in practically everything from feeding babies to milking cows. But in some things it can be downright dangerous because then we allow our actions to follow a set pattern rather than control our actions.

Take the case of the enterprising young vacuum cleaner salesman. Knowing that a certain husband took his daily constitutional by walking five miles home from work, he took to selling the wife a vacuum cleaner every afternoon. When Fido next door barked and the front gate clicked, it was time to duck out the back door. This became the routine and went on for several weeks until one day it rained. The husband got a ride home. Fido was staying dry in the doghouse in the back yard and the front gate forgot to click. Needless to say there was no sale, so our young friend had to enterprise elsewhere.

In the flying game, *Routinism* is the source of hundreds of accidents and near-misses every year. Most pilot factor landing accidents result from poor planning and mechanical actions. There is a definite lack of headwork in undershoots, overshoots, stall/spins, groundloops, wheels-up, collisions and taxiing accidents. The ultimate in poor planning is the fuel exhaustion accidents.

Routinism is a product of laziness or a reluctance to exert a minimum of effort to analyze a situation *before* trouble starts. A good example of this is the pilot who tries to salvage a bad approach. After months of making good landings, he suddenly finds himself in a dangerous situation on an approach. How he got there is vague at the moment and the least of his worries. The glands start to act up, he becomes charged with various hormones and his reflexed response is violent. He fights it down to a



S of ROUTINISM

landing because a waveoff is foreign to him. The trouble is that this character gets away with it most of the time and eventually winds up with his shoulder out of joint from patting himself on the back for his progress. He can always find more thrills in flying than anyone else. It becomes routine to look for trouble so he is hard to convince that *planning* is a necessity. Why should he plan? He plays it by ear and is an expert at extricating himself from any situation. If he lives long enough, he becomes a leader and sets the pattern for the junior pilots who emulate his every move. Some of them are not up to it and soon become, in the vernacular of a Safety Officer, statistics.

A sense of responsibility is the mark of a mature aviator. He knows that certain routines are necessary such as preflight, inspecting, using the checkoff list, planning the flights, briefing and debriefing, and keeping in good mental and physical condition. It is important to note, however, that none of these are directly associated with the actual control of the aircraft. These are necessary adjuncts to flying and the more outlined they become the better. The responsible aviator will never allow his flying to become routine. He is thinking all the time and anticipating his every move. He knows that conditions change and he is prepared to meet them.

Here are some of the pitfalls of *routinism:*

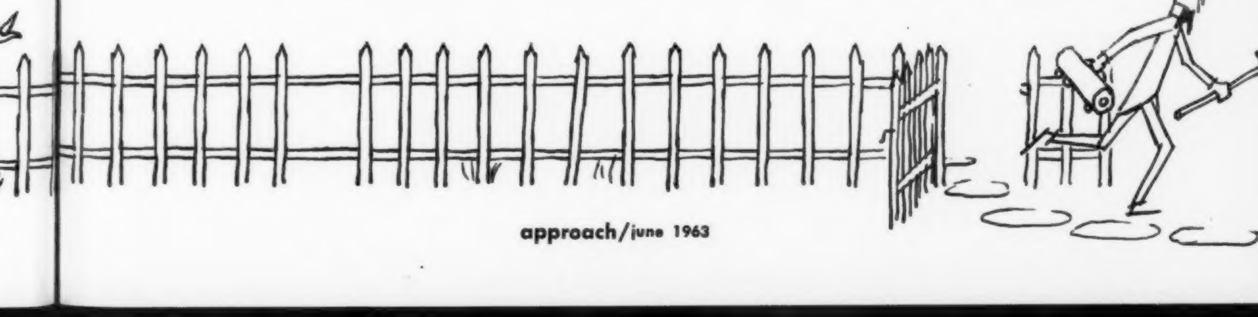
1. Land on a wet or icy runway the same as on a dry runway and attempt to turn off at the nearest intersection.
2. Land in a crosswind the same as into the wind.
3. Pull back on the stick to break a glide in a swept wing jet.
4. Pull power off to slow down in a swept wing jet.
5. Horse the nose up on takeoff before reaching flying speed.
6. Reach for the landing gear handle as the gear leaves the runway.
7. Put the gear handle down without thinking.
8. Taxi fast and use brakes excessively.
9. Avoid what is in front and let the man behind look out for himself.
10. Make a bombing or rocket run over water in haze the same as in clear weather.
11. Fly a local flight in marginal VFR weather with the same fuel reserve as in VFR weather.
12. Fly a regular mission after a lengthy lay off without a familiarization flight.
13. Make a let down through broken clouds the same as in *cavu* weather.

There are many more, but these are the most common. Regular, unvarying, or mechanical procedure creates strong habits and habit generally takes over when the chips are down. A little thought and a little planning will prevent just about any pilot factor accident you can name. But thinking and planning are continuing processes and the moment they falter, actions become routine.

Using the head during a flight requires more physical effort than lifting a ton of vacuum cleaners, but the effort is well invested when you can be satisfied with the way the flight was conducted.

There are three things that the pilot must know to combat routinism:

1. Practice makes perfect and the better we get the more routine our actions tend to become.
2. The more routine our actions become the more confidence we acquire.
3. The more confidence we have the less we have to think and, Brother, when you reach that stage—look out!—*ComNavAirPac* ***ASB 32-58***



There has been more heat than light generated in the past about thunderstorm flying. As a result much genuine misunderstanding exists. While philosophy is fine, it is the pilot in the cockpit who is boxed in the corner when either an emergency or operational necessity dictates a thunderstorm penetration.

THUNDERSTORM PENETRATION

by LCDR C. R. Smith and CAPT

Thirteen Navy jet aircraft accidents have occurred during the past five years as a result of thunderstorm penetrations. Not withstanding this small number of accidents, the thunderstorm penetration can be a most dangerous maneuver if inadvertently entered in a poor flight condition. The most obvious safe procedure is to avoid thunderstorm penetrations.

Chief of Naval Operations Note(OPNOTE 3750) set forth the following directive:

"Except for operational necessity, emergency, flights involving all-weather research projects or weather reconnaissance, Navy clearance authorities will not approve flights nor will pilots who possess clearance authority file through areas for which the U. S. Weather Bureau has issued an aviation severe weather forecast (WW) unless one of the following exceptions apply:

▶ Storm development has not progressed as forecast for the planned route. In such situations:

- VFR clearance may be permitted if existing and forecast weather for the planned route permits such clearance.
- IFR clearance may be permitted if aircraft radar is installed and operative thus permitting detection and avoidance of isolated thunderstorms.

▶ Performance characteristics of the aircraft permit an enroute flight altitude above existing or developing severe storms.

"It is not the intent of this OpNote to restrict local or cross-country flights within areas encompassed by or adjacent to a WW area unless storms have actually developed as forecast. The needless loss of aircraft in foolhardy penetrations of severe thunderstorms and squall lines cannot be tolerated. Mature judgment by clearance authorities in assessment of severe storm situation is mandatory and decisions shall not be contested by individual aviators regardless of instrument rating held."

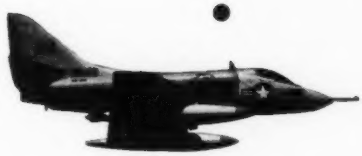
In complying with this and other current directives to avoid thunderstorms, the jet pilot's alternatives are limited. For example; in areas of solid cirrus blowoff and when lacking radar control, the pilot must top the storms in order to comply with current directives. *If for any of several reasons the pilot does not have the alternative of returning to base, the struggle to top out can be a grim contest in a non-afterburner aircraft.*

The Problem

The difficult problem is what to do when penetration becomes a possibility that cannot be avoided. Let's take a look at the facts bearing on this problem.

- The distinguishing characteristics of thunderstorm cells are severe gusts and drafts, heavy precipitation, high intensity static electric fields, and dense clouds. The height of some thunderstorms is known to exceed 50,000 feet. Ice particles, hypercooled water droplets and hail have been encountered at altitudes exceeding 46,000 feet and most likely exist at even higher levels.
- Gusts and drafts encountered in thunderstorms have caused no known structural failure accidents *in high performance jet aircraft*. Maximum normal accelerations measured in research flights are approximately 2.5 G.

ith and CAPT L. C. Pritchett, USMC



• There appears to be no marked difference between the magnitudes of vertical and lateral gust velocities from the 30,000-45,000 foot levels in a given thunderstorm cell. During some stages of buildup increasing gust velocities have been measured in the higher levels. Pilot discomfort and vertigo are usual in this environment.

• The airframes of newer higher performance Navy aircraft are specifically designed to withstand the gust spectral densities encountered in thunderstorms.

• During high speed penetrations, external sensing probes, venturi and the like are often damaged and even more often malfunction in ice particles and water droplets.

• Electric generator failures have occurred during jet penetrations either from icing or ice particle packing.

• Icing of lifting and control surfaces does not appear to constitute a serious hazard during jet penetrations above 30,000 feet.

• Electrical discharges to and from points on aircraft are sometimes experienced during thunderstorm penetrations, but no aircraft is known to have crashed as a result.

• *There is no single prevalent cause for jet thunderstorm accidents.* Engine compressor stalls/flameouts and aerodynamic stalls/spins are the two most frequent definitely known causes.

• The *greatest number* of incident and flight hazard reports, involving jet thunderstorm penetrations, are the result of erosion and impact damage from ice particles, water droplets and hail. The damage

has generally been confined to fiberglas, plastic, and thin sheet metal surfaces exposed to direct impact of the airstream.

- The *second greatest number* of incident and flight hazard reports, involving thunderstorm penetrations, are the result of erratic engine operation in precipitation and turbulence.
- Navy jet engines and inlet ducts are not specifically designed to operate in the thunderstorm environment at or above optimum cruise and combat altitudes.

Research vs Fleet Jet Penetrations

It is significant that no aircraft have been destroyed in thunderstorms during thousands of research penetrations. Modern jet aircraft can survive the environment found in thunderstorm cells. There are, however, important differences between research penetrations and typical fleet aircraft penetrations.

Research penetrations are an intentional evolution. The entry flight conditions are usually chosen to ensure reasonably safe aerodynamic, structural, flight control, and engine surge margins. At least research pilots are prepared for phenomena that will likely be encountered for the entry conditions selected. These pilots know from their own and other research pilots' experience that the aircraft will not fail structurally and that it can be controlled during the penetration. Thunderstorm research aircraft are generally especially configured with items such as metal nose cones and extra shielding.

High Entry Altitudes

On the other hand, fleet jet penetrations are generally inadvertent. Usual entry flight conditions for recorded flight jet thunderstorm accident are (1) very low aerodynamic stall and control margins and (2) full power engine operation near the surge line. It also appears from accident, incident and flight hazard reports that many of the pilots were (3) poorly prepared for the effects encountered and (4) had little confidence in their aircraft. The results of this combination of entry conditions are predictable and are borne out by the record.

In almost every case reported as an accident the entry altitude was far too high for safe flight or engine operation in thunderstorm cells. *It is probable that four factors influence pilots to make the sometimes fatal error of entering too high.*

▶ Firstly, the All-Weather Flight Manual, Pilots Handbooks, and NATOPS stress entry indicated airspeed or mach number. It can be a dangerous mis-

What about Continuous Ignition?

The NASA advisory committee on aircraft operating problems commented on this and related problems as follows:

"In addition to the research needed to improve power-plant efficiency and engine types, problems exist with current engines such as sensitiveness to ingestion of foreign objects, rain, hail, . . . Most turbojets have considerable tolerance to the ingestion, at moderate altitudes, of large amounts of water in its several forms. However, above 40,000 feet compressor stall margins decline rapidly and increase the sensitivity of the engine to ingested water. When avoidance of cumulus clouds is not possible pentration is usually done at reduced engine speed for structural reasons, but also makes flameout more likely.

"Consideration should be given to the development of a basic engine design that would not have the characteristic flameout tendencies and low compressor stall margins above 40,000 feet altitude of present engines. However, since making major modifications to current engines to alleviate these flameout problems are unlikely, it is recommended that other means be developed. The most direct approach would be to devise an ignitor which senses flameout for the combustor and comes on at once. Rapid action is desired so ignition occurs while the combustor pressure is still high enough to permit relight. If the engine rotational speed declines appreciably following flameout it may be necessary for the airplane to descend to lower altitude to effect a relight.

"The need for flameout detectors can be avoided if a suitable continuous ignition system is provided for use during takeoff and flight in bad weather. A parallel program to investigate glow-plugs for relighting the combustor is also desirable and promising

take to accept the minimum airspeed/mach criteria in these manuals for very high entry altitudes. This will become more apparent in the following discussion.

▶ Secondly, as mentioned previously, in complying with current directives to avoid thunderstorms, the jet pilots' alternatives are limited.

▶ Thirdly, it appears to be commonly believed that the hazards associated with thunderstorms diminish near the top of the convective cloud. This is an erroneous belief when considering altitudes above 25,000 feet.

▶ Fourthly, the unstable characteristics of jet engines at high altitudes, when operating in precipitation and turbulence, are not adequately described in most Pilots Handbooks, NATOPS, or the All-Weather Flight Manual. Accident, incident, and flight hazard reports indicate that some pilots are poorly informed on this subject.

Assuming that fleet jet aircraft will encounter the most severe turbulence yet measured during research penetrations, it is quite possible to prescribe an envelope of airspeed/altitude combinations for specific fleet jet aircraft that ensures safe aerodynamic stall, control and structural stress margins. In this respect each aircraft is a special case; however; all modern fleet jet airframes are specifically designed to withstand thunderstorm turbulence and older jets have inadvertently demonstrated this capability.

It is theoretically possible to prescribe a safe envelope for stable engine operation during thunderstorm penetrations for particular aircraft/engine combinations. However, sufficient information is not now available for this purpose.

From analyzing particular accidents, incidents, and flight hazards, the F8 (F8U) (J57), A3 (A3D) (J57), F4 (F4H) (J79) and A5 (A3J) (J79) can be expected to have compressor stalls when subjected to precipitation and turbulence that is well within stall, control, and stress margins for the airframe. It is evident from these reports that engine operation, if more thoroughly investigated, will place more stringent limits on penetration airspeed/altitude than will airframe performance.

The information now available strongly indicates that penetrations if unavoidable must be made 3000—5000 feet below optimum cruise altitude for stable engine operation at subsonic speeds. The alternative is to go to supersonic speeds during unavoidable penetration at or above optimum cruise altitudes. But supersonic penetrations do *not* appear to be a safe alternative when other factors are considered.

developments already exist. . . ."

Naval Aviation Safety Center records indicate that at least three aircraft (of one model) and one pilot have been lost as a result of flameout subsequent to inadvertent entry into thunderstorm activity or cirrus blow-off. Seven additional flameouts (same model) have been reported in which a relight was obtained and no damage sustained.

The number of these accidents/incidents that would have been prevented by continuous ignition can only be a matter of conjecture, however, it is believed that a high percentage, and possibly all, would have been eliminated.

The fact that these incidents usually occur at extreme altitudes (approximately 45 to 47 M feet), often in cirrus blow-off (ice crystals or possibly supercooled water droplets) indicates the possibility of a phenomenon at that altitude which has not been fully explored.

Continuous ignition systems under development appear to have merit but a requirement exists for an interim measure pending acceptance of the optimum system.

One interim measure readily available is pilot selective continuous ignition. It can be installed by bypassing the igniter timer and placing an on/off switch in the circuit. It can be installed at squadron level with material presently available to the squadron. This system would be utilized as is the pitot heat, when required, and is only considered an interim measure until the optimum continuous ignition system is accepted.

Headmouse thinks its easier, cheaper, and safer to replace burned out igniters from time to time than to lose an aircraft or crew.

Erosion and Impact Damage

It can be theorized that erosion and impact damage caused by precipitation are functions of the size and density of particles, time and true airspeed. The impact velocity of the particles (true airspeed essentially) is probably the dominant factor. Any reduction in *true airspeed* that can be *safely* obtained considering stall and controllability will reduce impact and erosion damage. Research aircraft with metal nose cones have made supersonic penetrations while following slower speed "hail-probe" aircraft. The erosion of the supersonic aircraft by ice particles or super-cooled water droplets was quite spectacular. A chance encounter with hail at these speeds would probably have been disastrous, so high mach penetrations in soft nosed fleet aircraft cannot be recommended as a safe procedure.

Icing

Icing of aerodynamic and control surfaces is a function of the number and size of super-cooled water droplets impinging on the aircraft during a given penetration. More ice would accumulate during a very slow penetration than during a very fast penetration, but the rate of accumulation would be greater at higher speeds. The rate of accumulation should not be very significant as it regards severe icing of aerodynamic and control surfaces during a single cell penetration, but will be a factor in icing of pressure and temperature problems as the rate of ice accumulation exceeds the heating capacity of the sensing device. Slower true airspeeds should be beneficial in this respect. A particularly annoying form of icing occurs at high altitudes and high true airspeeds when small, high velocity ice particles pack into probes, venturi and the like, faster than heaters can evaporate them. These particles will pack into any crevice exposed to the airstream and they constitute a real hazard, both for instrumentation and structures. The high true airspeed/high altitude effects have not been completely investigated. No high mach penetrations have been made above 44,000 feet.

Lightning

Electrical discharges between static fields in the convective cloud involving the penetrating aircraft are generally treated as a distraction rather than a hazard. There are, however, unexplained accidents and the possibility of a pilot being incapacitated by a lightning strike cannot be ignored. Two incidents have been recorded wherein pilots were affected by an electrical discharge. This possibility should be minimized. The intensity of the static charge, building on nonconductive aircraft elements, in a thunderstorm cell depends on several factors. One of these factors, the only one that pilots can conviently control, is true airspeed. A reduction in *true airspeed* during penetration can result in decreased intensity of the static charge on an aircraft flying in precipitation. The safe way to reduce TAS is to reduce altitude.

Electrical Failure

Primary electrical system failures during thunderstorm penetrations have occurred in systems where brush generators are cooled by direct blast from the outside airstream. Other electrical system failures occur simultaneously with engine flameouts in systems where engine compressor bleed air is used to power generators. Drop-out emergency generators have not been completely tested in the thunderstorm environment. Needless to say, primary electrical system failures are a real hazard and pilots should be prepared to use alternate and emergency electrical power sources if required.

Conclusions

More information is needed about engine operation in the ice crystal environment and turbulence before really safe penetration airspeeds and altitudes can be prescribed. At present it can be said that turbojet engines are susceptible to flameout in the ice crystal environment at or above optimum cruise altitudes during thunderstorm penetrations. Safe penetrations have been made at subsonic speeds 3000-5000 feet *below optimum cruise altitudes.*

Accident reports and research penetrations leave little doubt that it is safer to penetrate the most severe part of the thunderstorm at airspeeds above the minimum range prescribed in handbooks and NATOPS than it is to stagger into the top of the storm at or below minimum recommended airspeeds. If you have to go in, jump in and fly the airplane.

LCDR Charles R. Smith graduated from the Naval Academy in 1949 and was designated a Naval Aviator in April 1951. He served 3 years in an all-weather attack squadron, then attended MIT where he obtained a masters degree in Aeronautical Engineering. LCDR Smith is a graduate of the War College and is now assistant head of the Maintenance and Material Department at the Naval Aviation Safety Center.

Captain Louis C. Pritchett received his Marine Corps Commission in 1955 after completion of OCS training. He was designated a Naval Aviator in May 1957 and made his first tour with VMA-331. After a two-year tour with VMA-242 Capt. Pritchett reported to the Naval Aviation Safety Center where he is assigned as Avionics Officer in the Material and Maintenance Department.

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Safety does not come from selling safety itself, but from *selling* the things which make safety inherent in the operation.—*Anon*

All Pilots READ

Dumping Fuel

OCCASIONALLY it becomes necessary to jettison fuel in flight, and the big question is, what is the recommended minimum fuel-dumping altitude? There are three factors involved in arriving at an answer to that question: 1) development of a flammable mist near the ground; 2) toxicity to human beings and animals; and 3) harm to vegetation and soil.

In researching this problem, the Operations office of one airline queried an oil company, a government bureau, and several NASA Technical Notes before coming up with the following answers:

1. Development of a flammable mist near the ground is remote if the fuel is dumped above 1000 feet;

2. No toxic effect will be produced in either humans or animals if the fuel is dumped above 1000 feet;

3. While no specific dumping altitude minimum has been given with regard to vegetation damage, it appears necessary to choose an altitude considerably above 1000 feet to assure complete evaporation of the liquid fuel.

In view of these findings, a *minimum of 6000 feet above the terrain is recommended for dumping jet fuel in other than emergency situations, weather permitting.*

The FAA has stated, "The Vapor Zone behind an airplane dumping fuel is that airspace at least 1000 feet above, 2000 feet below, five nautical miles horizontally behind, and one-half nautical mile on either side of the aircraft jettisoning fuel." It being the responsibility of Air Traffic Control, during IFR conditions, to provide adequate separation between aircraft, ATC must be notified of the fuel jettisoning before and after the dumping operation. ATC will broadcast this fuel-dumping advisory every 3 minutes until the dumping has been accomplished. After receiving such advisory, all pilots in that area must stay clear until ATC advises the jettisoning has been completed. This applies to those not on an IFR flight plan as well as those on a special VFR clearance.

Pilots who must dump fuel are cautioned against flying a circular pattern while dumping, to eliminate the possibility of returning their aircraft to the Vapor Zone.
—FSF Bulletin 62-11

Malfunction of Flight Controls

A RECENTLY published instruction concerning inspection and reporting of malfunctioning flight controls states that numerous cases have been reported wherein, subsequent to flight, pilots have found the controls to be jammed while the aircraft were on the ground. Due to the fact that the controls were freed by excessive pressure before an inspection could be made, the causes for the jammed conditions in many cases could not be found. Consequently, no positive corrective action was taken before the aircraft were released for flight. In some cases accidents occurred on such aircraft shortly thereafter. According to the instruction, the following action is required:

a. All pilots finding the controls jammed or restricted while the aircraft is on the ground shall make no effort to free the controls by force on the controls. Hold light pressure against the restriction and call for an immediate inspection.

b. On airplanes using hydraulic power in the flight control systems, and where separate ground connections are "teed" into the hydraulic system, external power shall be applied to maintain system pressure prior to shutting down the engine(s). A visual inspection shall be made for evidence of jamming while maintaining pilot effort on the controls and with hydraulic power on the system.

The foregoing is taken from BuWeps Inst 3750.3 dated 12 September 1962 which is more comprehensive and considers both inspection and reporting of flight control malfunctions.—*NASC Crossfeed*

Weather Flying Notes

Below Minimum Approaches

Pilots continue to commence instrument approaches when the weather is far below the published minimums. OpNav Instruction 3720.2A is very specific in its limitation of such approaches and sets forth the following restrictions: "Except in an emergency, instrument approaches in reciprocating engine type aircraft shall not be commenced when the reported weather is below field minimums unless it has been determined that the aircraft has the capability to proceed to an alternate airport in the event a missed approach must be executed. For jet aircraft, an instrument approach shall not be commenced when the weather is below field minimums unless an emergency exists."—*Alameda Newsletter*

Minimums - a Tricky Business

An airline captain of considerable experience cautions pilots against relying too completely on the ceiling and visibility reports that are just above minimums. He says that when such a "close" report is received, instead of staying on instruments during the descent the crew subconsciously is induced to search for the airport's approach and runway lights. The crew looks and looks and looks for the lights, while the aircraft gets lower and lower and lower until. . . !

Accidents have occurred, some fatal and some not fatal, but the non-fatals often are just a blink of an eye from mortality. Recently, the crew of an air transport was given a ceiling and visibility report that was barely above minimums for that airport. To expedite the landing, the crew accepted radar vectoring for a straight-in approach. As the flight reached specific distances from the runway, it was given recommended altitudes: 5 miles—1500 feet; 4 miles—1200 feet; 3 miles—900 feet; and 2 miles—600 feet. After the flight passed the 3-mile point, the radar controller issued a steer correction advised that at 2 miles the flight should be at 600 feet altitude and then stated, "1½ miles from end of runway, approaching ASR minimums, you should have runway in sight at this time." The ASR minimums for this approach were 400 feet altitude and 1 mile visibility.

According to crew testimony, the flight was slightly above the recommended altitudes up to and including the 2-mile position, but at this point dense smoke mixed with fog was encountered. The crew stated the aircraft entered this smoke and fog at an altitude of 680 feet.

The aircraft was not leveled off at the ASR minimum altitude and continued descending, its rate of descent obviously increasing (to about 1200 FPM) until it struck the tops of trees some 4,000 feet from the approach end of the runway. Full power was applied, the aircraft was pulled up, and a landing was made on another runway after the captain circled the airport visually. Fortunately, there were no injuries to the passengers or crew but the aircraft was damaged substantially.

According to the official accident report, "The two altimeters were not cross-checked during the approach," and "The captain was not looking at his altimeter because he expected to breakout into the clear at any second. Neither the first officer nor the flight engineer could recall any altimeter reading."—*Flight Safety Foundation Bulletin*

Flight In Rain

When flying in rain, in addition to poor visibility there is a refraction error in vision. There are two reasons for this: the reduced transparency of

the rain-covered windshield, which causes the eye to indicate a horizon below the true horizon; and the shape and pattern of ripples formed on the windshield which causes objects to appear lower.

"Either or both of these can cause an error in angle of approximately 5°. Thus, an object one half mile ahead of the aircraft can appear to be 200 feet *lower* than it really is. This can become a hazard during a circling approach or on final approach to landing."
—*FSF Bulletin*

Wet Runway Stopping

RATIONAL runway requirements, with operational accountability for slipperiness due to water, slush, ice or snow is a problem which has long sought a satisfactory solution. Considerable work has been done on this subject, especially since the introduction of criteria for lowering jet landing minimums.

The following excerpts, taken from an article titled "The Board Finds" which appeared in the "*Interceptor*," USAF Air Defense Command magazine, concerns a T-33 approach and landing under weather conditions of 300-2-½ and rain. It is interesting to note the close relationship of the problems to those of heavier jets and the number of correlations that result from reasonably similar speeds even though the T-33 is a comparatively light airplane.

"The runway had a reputation for abnormal slickness when wet. The investigation turned up two sworn statements attesting to lateral sliding that could not be controlled with braking until the airspeed was very low. Our victims were in an uncontrollable broadside when they hit the stanchion.

"The point, however, is that the pilot involved in the accident was judged to have touched down too far down the runway to successfully complete the landing roll under known conditions of poor braking action.

"This is not good. A combination of four known adversities caused that accident, and not one of them is going to be corrected as a result of a pilot-error finding.

"First, we've known for years that runway behind us is useless. And with the ILS and GCA glide slopes terminating at the 1000-foot point, all low-slung fighters and trainers are pushed pretty well down the runway at approach speeds.

"Secondly, we all know that reported visibility means little to a T-bird pilot if it's raining. It can be anything from zilch, in heavy rain, to almost what the naked eye of the observer can see, if it's only a drizzle. And this doesn't help you one bit in your effort to beat the glide slope problem.

"Next, slick runways. There's not much we can say about this. AIO buys 'em; Edwards flies the landing distance tests; AFLC writes the handbook; NASA conducts the traction tests for tires; supervisors tell you what to do, and you do the best you can with what you have.

"Unfortunately, some folks hold the view that if they can stop on a particular runway everybody should be able to—and they possess little tolerance for the extreme minority who encounter multiple bad breaks. *We happen to hold the view that the number of people who have met all the negatives in one landing is roughly equal to the number of landing accidents we have.* (Italics supplied by APPROACH).

"We have two suggestions to offer relative to super-slick surfaces. The first is an appeal to commanders and base operations officers: Please NOTAM such conditions in the appropriate remarks sections of the FLIP directory. And for pilots: Run scared from the time you flight-plan into a rainy situation until you chop the throttle at the chocks. Ask someone!

"Finally, Adversity No. 4—worn tires. We had sufficient doubts (based on accident frequency) to take a closer look at tires as well as pilots. NASA astonished us and the industry with the preliminary findings on their high-speed tests of high pressure tires on wet surfaces. As reported in our 'Cold Hard Facts', a ribbed tire with less than 20 percent tread remaining (about 1/16th") is as good as bald. And a 'baldy' has about one-third the traction of a new ribbed tire.

"This means many things. First, it means that the handbook factor of 1.8 times landing distance for wet runways is useless as a guide. If we presumed the test to have been run on new tires we might have to triple that factor. In any case, you become Number One here again: Know your tread depth on every flight. If your tires are worn, you'd better be super-cautious on a wet approach. You don't dare settle for a normal ILS touchdown point on many of our marginal runways (7000-8500 feet)."

Ed. Note: *The Air Force uses a handbook factor of 1.8 for wet runways. FAA uses 1.67. ALPA is pressing for considerably more.*—"ALPA Tech Talk"

Altimetry

Low & Slow

Recently a jet type flying the Far East received an erroneous altimeter setting while making an instrument approach during IFR conditions. As tree tops blurred by the cockpit on break-out of the overcast, the captain guessed something was wrong. Investigation revealed the altimeter setting he had received and dialed in was 30.27 . . . whereas the correct setting was 29.28. This resulted in the bird being considerably closer to the ground during the approach than was planned.

"Obviously this was an unfortunate error on the part of the controller. However (Sunday morning quarterbacking now), a sharp pilot can catch this kind of mistake if he will eyeball the forecast destination altimeter setting . . . then jot it down for easy reference. When he receives an altimeter setting prior to and during his approach at destination, he can crosscheck it with the forecast setting. Any deviation of more than 0.20 inches between the actual and the forecast setting should be challenged."—*MATS Flyer*

Baro Subdial Readjustment

AT one time it was considered standard practice to readjust the baro subdial setting with respect to the pointer indication. Today, however, most operators issue directives prohibiting this practice. In response to numerous inquiries from customers, Kollsman Instrument has issued a statement of its policy and position on the matter. Following is that statement:

"Kollsman does not recommend that the barometric adjustment be reset in the aircraft, for these reasons:

1. *Faulty Standard*

There are various factors which could cause or contribute to a 'faulty' correlation of barometric scale and pointer. Of utmost importance is knowing the accuracy of the standard against which the barometric setting of the altimeter is made. If this standard, for instance, is an Altimeter Setting Indicator located in the tower, its calibration according to the applicable spec., compared with a mercurial barometer of known accuracy, may vary + .020 hg, which is equal to + 20 ft. Therefore, the altimeter at one field could be set to a standard which could differ from a similar standard at another field by a max. of 40 ft. due to the difference in standards alone.

2. *Hysteresis*

An altimeter, right after landing, could indicate 15 to 20 ft. high due to after-effect, depending on the duration and height of flight. A resetting of the barometric to pointer relation should not be made right after a flight. It requires from 10 to 12 hours at ambient barometric pressure for the diaphragm to fully recover from hysteresis. However, additional flights within a 12 hour period would not result in an accumulation of hysteresis or after-effect.

3. *Repeated Adjustments Error*

Repeated adjustments in the same direction of less than 40 ft. but accumulatively exceeding 40 to 50 ft. could affect the calibration excessively throughout the range. Removing the instrument from the airplane and maintaining a log of all adjustments should prevent repeated adjustments which, accumulatively, exceed 40 to 50 ft. without checking calibration.

4. *Difference in Elevation*

When an instrument mechanic calls the tower for a barometric reading which he then sets into the altimeter, the aircraft may be at rest on a parking ramp, the elevation of which differs from the known elevation of the runways, and the reading he gets from the tower may not be correct for the particular location of the aircraft. Also, the aircraft may be exposed to a cross-wind which could cause a faulty pressure in the aircraft static system.

"It is not necessary to recalibrate the instrument throughout its entire range when correcting the barometric adjustment by removal of the knob lock, unless such adjustment is repeatedly made. It is considered normal procedure to reestablish the proper relation between barometric pressure indication and pointer indication by this means built into all altimeters. If such an adjustment does not have to correct for more than 40 or 50 ft. from the original setting, the effect of such adjustment on the calibration of the altimeter, over its full range, is negligible."

Case of the Bubbling Fury

WHEN IT happened, I initially thought my incident was in a class all by itself. But much to my surprise, when I mentioned it to a couple of squadron pilots, I discovered that it had happened to the squadron. I believe the tale deserves to be told, because it just might happen to *you!*

It began after the routine preparations for a ferry flight in an AF-1E (FJ-4B) from an East Coast air station. Upon completion of start and ground checks, the signal to pull chocks was given the Plane Captain. At that moment something strange in the cockpit caught my eye. There was a slight but notable "bubbling" or "effervescent effect" silhouetted in the Turn-and-Bank Indicator. It appeared something like a freshly uncorked bottle of champagne. I first thought this to be a reflection from the sun. Holding my hand against one side of the instrument panel did help a little to reduce the bubbling effect. Oh well, it was just an hallucination, besides the temperature was a chilly 20° and I wasn't exactly in the mood to freeze out on the line.

With clearance to taxi I proceeded toward the runway. Again my eyes were drawn to the instrument panel. The turn-and-bank indicator was partially filled with a clear liquid, and appeared much like a wet compass. My first impression was that this was water in the system, as the plane had not flown for over a week, and had been exposed to weather. I continued to taxi. But now I was giving a little more attention to the turn-and-bank indicator. By the time I reached the approach end of the duty runway, the instrument had filled and was seeping fluid. This was too much! Curiosity got the better of me. After removing my O_2 mask, I took a sniff of that innocent appearing liquid. Lo and Behold—JP fuel!

A little bewildered, I returned to the line, shut down and reported what happened to the maintenance crew. JP fuel in the turn-and-bank indicator? This called for a consultation with the HMI. Inspection revealed that a faulty fuel vent dump valve in the fuel manifold had allowed expanded fuel to escape into the air lines of the windshield heat-defrost, anti-G suit, and turn-and-bank indicator.

Smelling strongly of JP Fuel, I returned to Operations to make out the "Not RFI" message. While debating whether or not to list the reason as "Fuel leak in the turn-and-bank indicator" (surely they would think I had slipped a cog), I felt a sudden burning sensation on my leg. A quick inspection revealed that JP fuel had penetrated through my flight clothing on my leg. A trip to the locker room, and a little soap and water solved the problem for the present. Later I checked with Medical to make certain no damage was done.

From now on when flying the AF-1Es (FJ-4B), I will keep a clear eye on the turn needles. And to all you Fury drivers, if you should happen to see bubbling in the turn-and-bank indicator, watch out! It's not an illusion, it's JP!

ANYMOUSE

Tamiami Caper

"WHEN a helicopter is flying airways it can, unlike any other aircraft, be deployed at a moment's notice on a rescue mission."

The story recounted below is true and bears out the above statement.

We were flying in an SH-3A (HSS-2) on a cross-country from Norfolk to Key West. We had just passed over Miami Tacan on our last leg to Key West when I noticed a light flashing at us. The terrain over which we were flying was typical everglade country, trees and high rushes growing out of dank water. The light kept on flashing so we decided that there must be somebody down there in trouble. We swept round and put on our spot light and there in our beam was a jumble of framework and a propeller. On completing our visual pass we came round again for a pick-up. The framework was an airboat with a stopped engine hard and fast in the weeds. Unfortunately we had no communication with the aft station but we were able to hover close aboard the craft and lift the distressed man up into the aircraft. We then broke hover and made for the Tamiami Trail so that our survivor could be put back to safety on terra firma. When communication was restored between the crewman and the pilot—consternation reigned. The following conversation then took place:

Pilot to crewman: How is he?

Crewman: Fine.

Pilot: What was wrong with him?

Crewman: He says nothing.

Pilot: Nothing! Why did he allow himself to be picked up?

Crewman: He says he did not know what was going on and he wanted to have a ride around in a helicopter.

Pilot: What was he doing flashing a light around the place?

Crewman: He was attracting frogs. He says he is a frog gigger.

The question now arose, where did he want to be landed? You have guessed right: On his boat!

With a sinking feeling we began a 360-degree turn. How were we going to find an unlighted boat in the middle of the Everglades? Legal suits, courtsmartial and humorless derision would be our lot, our hopes of glory had crashed from a zenith to a nadir. But, Lady Luck was smiling on the would-be good samaritans, there as large as life in our spotlight beam was the boat still firmly hard and fast in the weeds. It took little to no time in lowering our survivor back on the boat. I must say that I had a slight malicious hope that he would be ducked in the water; however professional pride overcame this un-Christian thought. I am still wondering though if Sikorsky will give me one of their silver wings awards. For after all how did we know he did not want to be rescued and was only trying to attract frogs.

I don't think that any Englishman has ever been so completely duped by the frontier spirit since the glorious days of 1776.—*M. F. BARSTOW, LCDR Royal Navy*

One To Go!

For the flight deck people it was just another F-8 (F8U) to be catted. But for me it was the last scheduled carrier launch before release from active duty. And with 99 arrested landings already logged I wanted the one which make me a Centurion before becoming a civilian.

The aircraft had previously checked OK for a Condition II CAP and now I was pulled up to the cat. As I started to add throttle for tensioning, I heard two bangs like compressor stalls—something wrong with the fuel control or the air conditioner? I shook my head and the shot was suspended.

When the airplane was checked over, a chain bag with several chains was found in the intake. They had been placed there the night before by the plane captain, contrary to squadron doctrine. The aircraft was later run at idle with a screen on the intake duct. Next morning the plane captain signed off his inspection of the intake duct (supposedly all the way back to the engine) after a quick glance. He had overlooked his chains, merely assuming they had been picked up by somebody else.

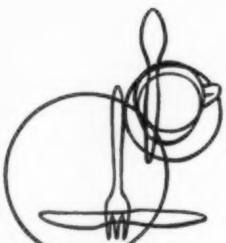
As long as the engine was at idle, the bag and chains didn't affect the air intake too severely. When the throttle was advanced however, the compressor stalls occurred. I feel sure that the inertia of a cat shot would probably have put some of the chains into the compressor section and I wouldn't have been able to get my 100th arrestment in anyway.

Bang

DROPPING live ordnance for the first time, my roommate and I proceeded to figure out mil leads and guess at one terminal or release air speed with our heavy loads for best accuracy.

The target at Malta was closed and our two divisions decided to drop smoke lights and practice on them. Two of our eight aircraft were unable to release all or part of their bombs. In both cases the 1000-pound bomb on the center station was still on the aircraft. By this time it was dark and we were back at Marshal awaiting recovery. A call had been made requesting that we land aboard. The answer was to proceed outbound on a radial and jettison our load by any means. I gave the lead to my wingman and told him to comply. He proceeded outbound and entered a descent. I moved out to a loose wing position to avoid the drop tanks, knowing the only method he hadn't tried was manual release. We were being rushed by either CCA or our division leader as our EATs approached. I called and said to give it a try. At the same time I noticed we were in a descent and less than 800 feet. I made another transmission for him not to go too low. He put his aircraft into a climb and pulled the release at about 1000 feet. Neither of us thought about the minimum release altitude of 2500 feet for a 1000-pound bomb and if it hadn't been for the tenth of a second delay in fusing both of us would have gotten very wet or worse.

P. S. The bomb was dropped in the arming safe position but still detonated.



HEADMOUSE

HYPOGLYCEMIA

Dear Headmouse:

As a squadron commander, and now as a Bureau of Naval Weapons Representative, a problem that has continually worried me is the eating habits of naval aviators. In particular, bachelor naval aviators who feel that they can carouse to the late hours of night, jump out of bed at 0730, and muster at 0800, not having had any nourishment.

Back about 12 years ago, I was a witness to an aircraft accident involving an A1 (AD). This young aviator was a member of a flight of four aircraft. The flight leader, having noticed erratic flying, ordered the pilot to return to home base. During final approach the aircraft waddled, became slow, and hit the ground in somewhat of an uncontrolled fashion. The aircraft was a strike, but the pilot was unhurt. As a result of the flight surgeon's examination, the report indicated that his blood contained insufficient sugar. This pilot had had no breakfast and no organized evening meal the night before. The flight surgeon indicated that, as a result of inadequate and improper foods, his blood sugar level was down and, therefore, normal mind and body functions were affected.

The diets of bachelors are a problem. I know of one who goes from evening meal to evening meal, and sometimes misses an adequate evening meal. I would like to have some indication as to the advisability of such habits and as to whether or not there are, indeed, dangerous side effects from the lack of proper food while piloting aircraft.

If there are dangerous side effects, perhaps other squadron commanders and/or the entire Navy could utilize information on this subject.

C. G. WILLIAMS, CDR

▶ This subject has been of great interest to aviation medicine for a number of years. While there is not complete agreement on the hypothesis that hypoglycemia contributes to aircraft accidents, most medical authorities do agree that good dietary habits directly benefit over-all physical condition and thus indirectly contribute to pilot efficiency. To quote the Aviation Medical Safety Training Manual (NavWeps 00-80T-89), "Unfortunately, there is no such thing as an ideal diet. Each person must adjust to his own metabolic needs." However, flight surgeons are expected to "sell" good dietary habits to pilots and crewmen through lectures, films and training aids.

This same manual contains a discussion of diet as related to accident prevention from which the following paragraphs on hypoglycemia are quoted:

"Hypoglycemia is characterized by a decrease in the sugar level of circulating blood. Cortical cells are very dependent upon an adequate supply of glucose since they do not store appreciable amounts of glycogen as do muscle and liver cells.

"Hypoglycemia may occur with flying personnel due to inadequate diet. During flights of long duration, the flyer may fail to eat properly or, during periods of very strenuous exercise, when glucose utilization by body tissue increases markedly, the glycogen reserve of the liver may be exhausted in a few hours. These factors can singularly and collectively produce the hypoglycemia syndrome.

The initial symptoms of hypoglycemia are lightheadedness, amnesia and disorientation. As the condition progresses other symptoms may appear, such as sweating, vasomotor reactions, salivation and shivering. These are caused by the secretion of adrenalin, which is presented to the blood in an attempt to restore the normal glucose level. Additional and more severe symptoms and even death may occur in some instances but such extremes are not to be expected in normal aviators. However, any stage of the hypoglycemia syndrome will diminish the flyer's tolerance to altitude, affect his general performance and may increase the possibility of an accident.

"It should be noted that although hypoglycemia aggravates hypoxia, excessive sugar ingestion has no beneficial or protective effects.[1] In a recent report[2] it was noted that approximately 30% of a group of Marine Corps flyers

[1] Scarpelli, E. M. Physiological Training, School of Aviation Medicine, Randolph Field, Texas, 1956.

[2] Anon. Inadequate Diet. U. S. Naval Medical Newsletter, 1957, 29, 32-33.

Have you a question? Send it to Headmouse, U.S. Naval Aviation Safety Center, Norfolk 11, Virginia. He'll do his best to help.

tested for blood sugar content at the start of a normal working day failed to meet the assumed normal requirements. . . ."

Everyone has his own peculiar response (or apparent lack of response) to hypoglycemia. Therefore, hypoglycemia cannot be singly indicted each time it is associated with an aircraft mishap. However, there is no substitute for good dietary habits. Why take a chance?

Very resp'y,

Headmouse

Ops Decision

Dear Headmouse:

If the weather sequence report from a station shows no ceiling, visibility 3 or more miles, wind calm but the visibility on one runway less than 3 miles is that field under VFR or IFR? Recent experience has shown a divergence of opinion on this subject. A good argument can be developed on both sides but how is the pilot filing in to know?

LCDR J. E. COOPER
ASO, NAS, LEMOORE, CALIF.

▶ Under marginal weather conditions such as this question implies it becomes a decision of the operations duty officer as to whether the field remains VFR or goes IFR. There is no way for a pilot, filing to this field, to determine the field's status from the sequence report. It would be good headwork to file IFR since it's easier to file IFR and change to VFR than vice versa.

Very resp'y,

Headmouse

Dye Marker for Flight Deck Personnel

Dear Headmouse:

I read with interest the first letter appearing in the March 1963 issue on page 22.

It seems to me that the following recommendation is both feasible and practible towards remedying this particular problem in part.

A small encased pocket of dye marker located above the shoulder blade area on flight deck jerseys with water repellant material located on the inner pocket side to prevent sweat penetration, and a water repellant material over but not under the encased pockets outer side to prevent rainfall penetration. The above device should not be built into a jersey so that they may be washed, unless a cheap break-away type jersey is incorporated thereby allowing the jerseys to be surveyed as deemed necessary. By this method a man overboard would emit a dye marking in the water for some duration enabling quick and easy spotting by rescue aircraft.

This Anymouse is especially interested in remedying the situation concerned by the letter mentioned above since I am being ordered aboard a CVA in the very near future for duty, and the next one overboard might be me.

ANYMOUSE

Day Training Before Night Ops

A RECENT Flight Hazard Report involved a fatal injury which resulted when a relatively inexperienced plane captain walked into a prop after pulling chocks during night carrier operations. The accident occurred less than one month after the plane captain had been assigned to the line division.

In his endorsement the Carrier Division Commander stated: "This accident was caused due to inexperience of the plane captain functioning without proper preparation in an environment totally different from that in which on-the-job training was conducted. Regardless of the condition of night lighting and visibility, personnel operating in the hazardous atmosphere of a carrier flight deck must become mentally conditioned to the tempo of these operations during optimum conditions prior to assignment to night crews. Prior to being assigned to line duties on the flight deck at night, personnel must be made thoroughly familiar with flight deck operating procedures. It is considered that the only way this can be accomplished is to assign these personnel to day operations only, until they successfully demonstrate that they are competent to work on the flight deck at night. . . ."

The Carrier Division Commander further directed that the recommendation of the Board "that new men assigned to the line division be initially assigned to the day crew . . ." be implemented. ●

A Shaggy Shark Story

Several years ago at Survival Training I was made aware of the menace which sharks present to a downed airman. That awareness was later supplemented by a Sense booklet about sharks and by Friday night round table discussions with fellow pilots who while scuba diving had encountered sharks and narrowly escaped. It was during one of these Friday night debates that I suddenly found myself obsessed by the desire to discover a foolproof shark chaser.

My research knew no bounds. Time after time I viewed that stirring documentary cinema "The Shark Fighters" in hopes of finding a key to the solution. I scoured the libraries and through proper chain of command gained access to ancient periodicals . . . but to no avail . . . even the February 1953 *Playboy* (still with the center pages) did not hold the answer.

My frustrations grew as news came in of sharks attacking not only airmen but innocent people too. Then . . . one day, the answer came to me in a dream (actually I was just resting my eyes during a career planning lecture at an ALL Pilots Meeting). How brilliantly simple, *I had it! . . . That was it!* . . . A *head-on picture* of a BIGGER SHARK! I opened my eyes to find the ready room empty and started to jump up when I abruptly discovered that some prankster had knotted my tie around the arm of my chair. Concealing my enthusiasm I returned to my desk and feigned proof-reading a knee card of a Yankee Pattern, while actually drawing the prototype Shark Chaser.

At last lunch hour came and I travelled to a secluded fish pond in Balboa Park for the first momentous test. Unobtrusively I waded into the pond clutching my Shark Chaser knee card and stood there quietly. Attracted by crumbs from my brown-bag, some fish soon approached and although none appeared particularly shark-like, it was a start. I gestured to silence the small crowd that gathered on the shore and then . . . thrust the card into the water. By George it worked! *I tell you, it worked!!!!* Never in my life have I seen two carp and a skippy more frightened. I shouted wildly and bounded ecstatically from the pond, oblivious to the fact that I was taking the long way out. Now the crowd was cheering and rushing to pat me on the back, at least I thought so, until one congratulatory blow knocked my bridge cap off. . . . Boy those fish poles smart. Running with more purpose I reached the car, quickly rolled up the windows and while driving off caught a glimpse of the perfect spot for a commemorative monument.

Wearing dry clothes, I returned to the squadron at 1530. My mind now worked with frightening precision as I rapidly concluded that the soggy Shark Chaser card was not suitable for continuous use. It had to be made from?? . . . *rubber!!* The source of the latter was obvious. I asked Aerology about old weather balloons . . . and soon had a half dozen of them which the Aerologist claimed were BOCP.

Determined to have a perfect product, I employed a "shark artist" from Scripps, La Jolla to paint the first sheet of rubber. The fee was exorbitant but the results were worth it as now the limitless potential afforded by the new material became obvious. By stretching the Shark Chaser not only could the size of the shark be increased to fit the need . . . his *expression* could be changed as well. Foot and hand grips were attached to the corners and using these grips five basic shark expressions could be produced as follows:

(1) Raising right upper corner—"shark with right eyebrow raised."

(2) Raising left upper corner—"shark with left eyebrow raised."

(3) Pushing down with right or left foot—"shark giving right or left sneer."

(4) Pulling outward from center of sides—"shark smiling."

(5) Pulling up forcefully with both arms while keeping legs extended straight downward—

"shark ready to strike."

The latter expression proved so strenuous to produce that the face on the Shark Chaser and that of the user were equally as frightening.

Unable to suppress my zeal any longer I divulged my secret to a few selected friends. Their reactions though encouraging, were not as enthusiastic as hoped. One skeptic suggested that a picture of the Exec would have been more effective. Undaunted, I continued limited testing but lack of funds for the art work caused a delay in any proof positive test.

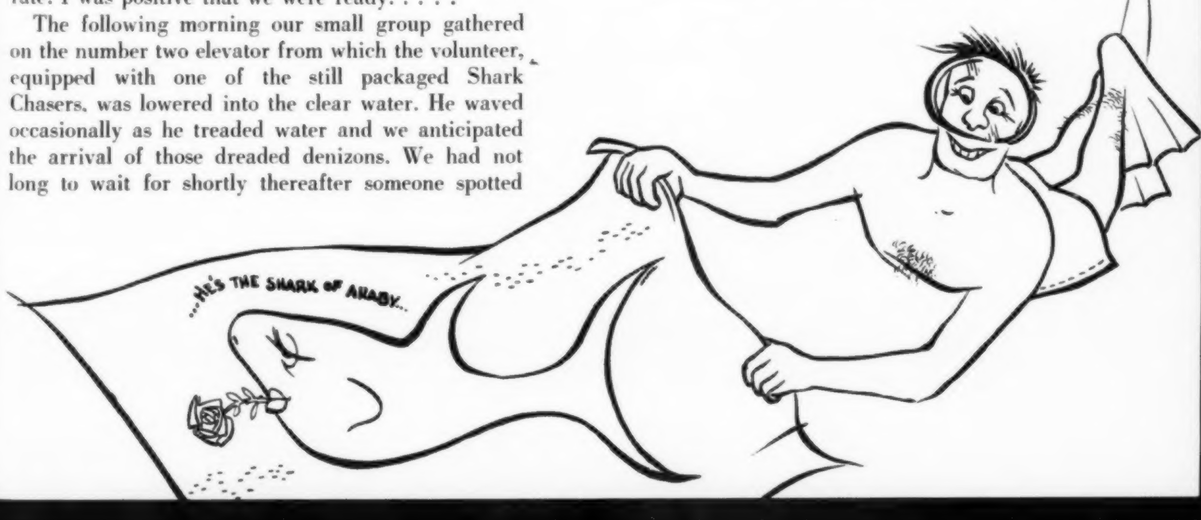
Our squadron deployed to the Far East and there I found the solution to the art problem. In Yokosuka while touring the world renowned International Shopping Plaza (sometimes called Thieves Alley), I chanced upon an art establishment whose quaint sign beckoned, "Name on Coffee Cup." At first my request puzzled the proprietor but through sign language and deft manipulation of my English-Japanese dictionary I became reasonably convinced that he knew what I wanted. A few days later I picked up the neatly packaged Shark Chasers and without inspecting them (an error I would later regret) finally agreed to pay the 150 yen. A short time later the ship sailed to southern waters near the fashionable beach resort of Olongapo, P. I.. Here at least were REAL SHARKS. I called a resolute "No time for THAT," to friends in the liberty boats headed for the bright lights and stayed aboard to make plans for the *Live Test*.

The need for a man to undergo a hazardous mission was announced and although it was an unusual sentence for a Summary Court, I soon had a volunteer. . . . How that man trained! With fanatical purpose he mastered every Shark Chaser expression and could perform the entire series culminated by "SHARK READY TO STRIKE," at a breathtaking rate. I was positive that we were ready. . . ! !

The following morning our small group gathered on the number two elevator from which the volunteer, equipped with one of the still packaged Shark Chasers, was lowered into the clear water. He waved occasionally as he treaded water and we anticipated the arrival of those dreaded denizons. We had not long to wait for shortly thereafter someone spotted fins marking the approach of two male hammerhead sharks! We shouted words of encouragement to our volunteer and pointed toward the sharks. He didn't wave this time but instead churned the water into a froth with his increased treading. As the sharks came into his view, he regained his composure and tore open the new Shark Chaser. The hours of training paid off for before long his feet and hands were in position and he methodically started forming the Shark Chaser expressions. With his back to us we could only observe his arm motions as he manipulated the Shark Chaser directly in front of the sharks. The latter, though relatively close, were definitely holding back and for a moment the wild thought, that they were enjoying it, passed through my mind. At last the climax approached and just as our volunteer in a spectacular finale assumed the "SHARK READY TO STRIKE" expression with a vertical spread eagle, the sharks began a frenzied thrashing and literally threw themselves at our straining associate. It was unbelievable!!!! . . . . The sharks weren't biting . . . just repeatedly leaping at our man. Poor fellow, we pulled him out barely in time, and though he was almost unconscious from the buffetting, he still clung doggedly to the Shark Chaser.

We were stunned! . . . What had gone wrong? . . . The answer was found when we examined the new Shark Chaser which our volunteer had used. Once again the need for Quality Control and Inspection became apparent for either through a gross error in translation or some fantastic hoax, this particular Shark Chaser not only portrayed the *wrong end of the shark, it was obviously FEMALE as well.*

Operational commitments and lack of volunteers have halted further tests and I turn to you for assistance in carrying on this great work. ●



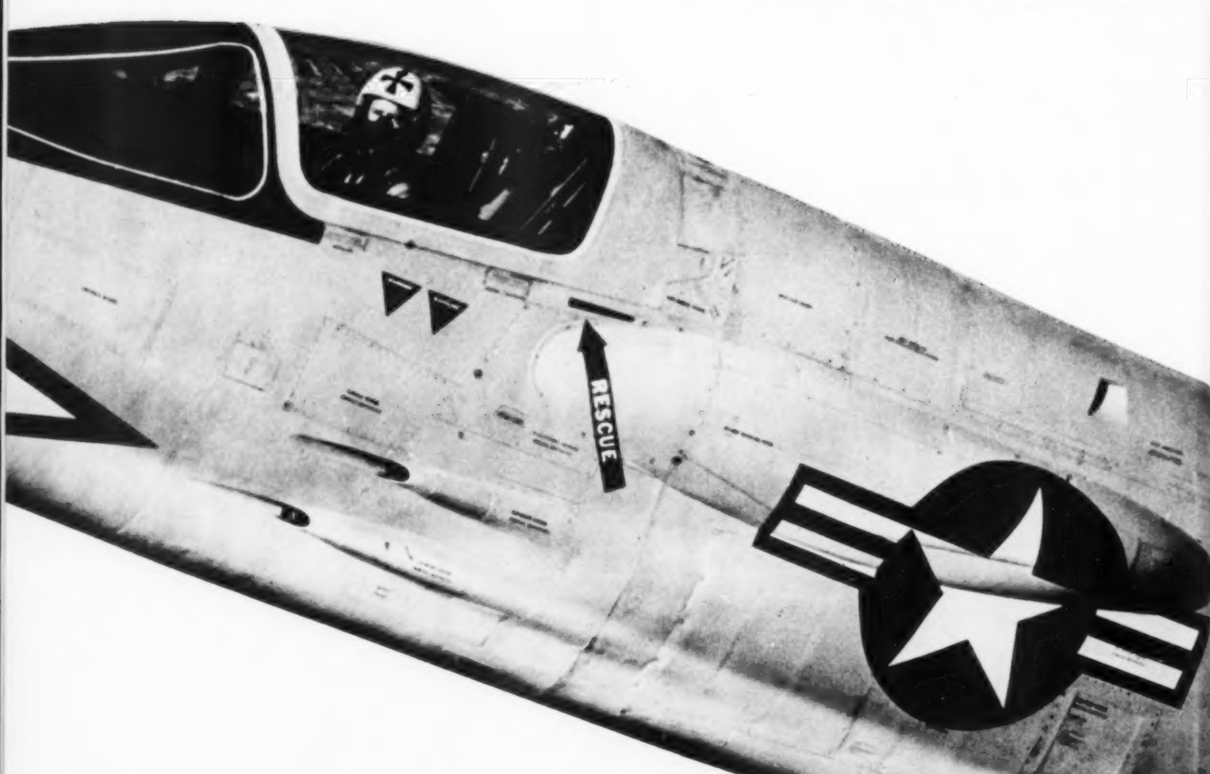
Problems in the cockpit are not going to be answered by new electronic developments. Sooner or later, we must deal with the man.

The Man in the Cockpit

In spite of the remarkable advances made in the fields of aircraft design and human engineering, aircraft accidents continue to occur, in some respects at a surprisingly high rate.

The earliest solution to accident problems was to ground flying machines during periods of severe weather because of their fragile structure. But as passenger, freight, and mail schedules, as well as military activities, became more demanding, the airplane had to fly in all kinds of weather. So a new approach was taken to insist that supports be strengthened, fabrics improved, the power plants made more reliable, and that further research and testing be done on wing configurations and load factors. In other words, the emphasis now was placed on making the aircraft safe.

Then we began to hear the words "pilot error." Engineers had become convinced that their contribution had been adequate, so they credited many of



the accidents that continued to occur to mistakes made by pilots. Unfortunately, "pilot error" was accepted as a "cause" for accidents, and for a while little was done to search beyond it. When this search was made, the internal environment of the airplane, particularly the cockpit, came under study. Now consideration was given to display-control relationships and to such factors as the eye movements required by particular instrument locations. Some major questions that were asked at this point were what instruments were watched and for how long, and where should they be placed for ready reference.

The location of controls and the shapes of handles concerned the investigators next, as they discovered through analyses of accidents that man did not learn new tasks as rapidly as new models of aircraft required him to learn them for safe operation. Simulators and procedural trainers became a dominant part of training in this period, and new meanings were given to such words as "learning," "set," and "transfer of training." Now for the first time we were dealing with psychological needs independent of the instruments which were posing problems.

As our technology advanced and both the ceiling and the speed of aircraft were increased, man's physiological needs were carefully scrutinized to avoid accidents from such causes as excess g-forces and oxygen deficiencies. The flight surgeon now came into his own, finding a new world to explore in low-pressure chambers, centrifuges, and pressure suits. As the pace accelerated, the job of keeping man in the picture, as error-free as possible, became a real challenge. Exo-skeletons and various other support systems were designed for him, which, although advantageous in many ways, introduced new problems. They caused delays in the pilot's response time, they obligated him to spend too much time with controls, they caused glare, they limited his mobility, and in other ways they became a potential source of accidents in themselves.

The pattern of accidents which continued to occur was such that we were soon led back to problems arising from information displays. Only now, instead of concerning ourselves with the questions "where" and "how" information should be fed to the pilot, we gave more thought to "what" and "why." Displays that might have been misread were revised, and more information was integrated before being displayed.

Today our pilots enjoy what appears to be excellent working conditions. They have excellent command of information about their aircraft and its situation, they perform many of their tasks easily because they are equipped with power-boosted systems, they have an almost unobstructed view of the aircraft's surroundings, they are well protected physically by automatic pressure suits, and when conditions warrant they can escape their ship instantly by means of built-in ejection equipment.

In view of these remarkable advances, it may seem paradoxical that accidents continue to occur because of "pilot error," even in "perfect flying weather." One is tempted to ask if the pilot is too well protected, too comfortable, and if the weather can sometimes be too good. If true, it certainly is a new "twist" in the accident story—one we would not even have dreamed of 10 years ago.

If the pilot's present conditions are not the best, then what conditions are? It is impossible here to give even a rough estimate; we can say only that a pilot's performance falls off as the demands upon him becomes more extreme, but that he senses changing situations relating to most of his tasks and automatically compensates for them. Important in this connection is the fact that he will not compensate for a change if he does not sense it. In other words, full attention to the job is essential. As obvious as this fact is, we are still a long way from achieving full attention.

For the pilot to remain alert, he must be subject to changing stimuli. This need has been demonstrated time and again—by psychologists through the monitoring of tasks performed by human subjects and through experiments in which subjects are deprived of certain sensations and by physiologists through neurological studies, particularly by the association of electroencephalograms and stimulation.

Another facet to this problem is that a man may become oblivious to stimuli which he actually receives if he anticipates a certain outcome of events to which the stimuli apply. In this case, he behaves according to a preconceived notion of what will happen rather than according to the facts of the situation. Many studies have been made of this so-called anticipatory behavior, particularly by the British. These investigations have shown, for example, that an individual viewing a radar scope may anticipate

by Dr. Richard Trumbull

when a pip on the scope will intersect a certain track or the perimeter of the scope, and he will base his action—which may be the firing of a weapon—on his anticipation rather than on what he continues to perceive. Obviously, considerable inaccurate combat tactical control can result from such action.

To illustrate this behavior in terms with which most of us are familiar, consider a situation involving two automobile drivers who are approaching each other on intersecting roads. During the few seconds that elapse before the cars pass, each driver performs an amazing number of calculations based on what he perceives, such as the following:

- Relative speeds of the two cars
- His speed relative to the speed limit
- Road conditions
- Conversation or activity in the car
- Other traffic in the vicinity
- His acceleration and deceleration capabilities

At some point, each driver will decide either that he can or cannot beat the other car across the intersection. He will then have made an anticipatory judgment. If he has decided to go ahead, he will probably cease preceiving and cease checking on whether his original estimate or anticipation was accurate. If he is tired, or talking to friends in the car, he is even more likely to cease these activities. He will continue to cross the intersection on the basis of the information available at that last point of reference—and he just might make it.

Let us change the scene now. Two cars are again approaching the intersection, but this time the drivers do not make anticipatory judgments. What conditions would have to exist to cause a driver to be so cautious? Here are a few:

- He is a new driver
- He is driving a new car
- He is in strange territory
- Something is wrong with his car
- The road is wet or icy
- Visibility is poor
- The other car is a fire engine, ambulance, or police car

The difference in accident potential between the two situations is obvious. The chance that a driver will use poorer judgment in the first example exists because conditions allow him to be less attentive. He is driving the same old car and expects it to respond in the usual way. He is driving over what he believes to be the same old route, and he expects that it has not changed in any way. "Ideal weather conditions" prevail, so he expects nothing unusual to happen.

Therefore, if some of his estimates or anticipations are faulty, if some of the things he thinks will hold constant vary, or if he fails to take some variable into consideration, he is in trouble.

The extrapolation to aviation is obvious. A well known example is the landing of propeller aircraft aboard carriers. To land safely a pilot must cut his engine at a precise moment. If he bases this action on anticipation rather than perception, an accident is more likely to happen. Similarly, a pilot on the "almost home" leg of a flight may set himself up for an accident by relaxing prematurely, assuming that he "has it made." He will anticipate conditions that will exist the rest of the way instead of taking account of them moment by moment.

An accident stemming from such behavior always gives rise to the comment, "I don't see how it could have happened." There will be the sudden appearance of an aircraft on the flight path or some other variable which the pilot probably could have known

about had he been attentive. But he had set his course, anticipated his procedure, and "tuned out" his personal input channels. One would not expect a pilot to turn off his radio after receiving his landing instructions, because he would know he might be given new instructions. Nevertheless, accident records prove that pilots have done so. More commonly, however, they turn off their personal psychological channels involved in flying.

Over-reliance upon instruments also contributes to the premature closing of psychological channels. This is so true in shipping today that the term "radar-aided collision" has appeared. A critical analysis of aircraft accidents—particularly involving aircrafts having highly sophisticated control systems—would surely reveal a counterpart in flying.

There will be times, strange as it may seem, when pilots involved in accidents could have avoided them if their working conditions had not been so good—for example, when the weather is marginal rather than perfect, forcing them to give more attention to their tasks. These will be literally senseless accidents because they will be caused by sensory systems that have been prematurely closed. Only by becoming more consicious of the need for the pilot to verify his situation continually will we begin to find the specific causes of such accidents. Our next goal will be to find ways of improving the pilot's situation by making it less "perfect." In other words, we will seek ways of keeping man alive by keeping him alert. This will be aviation's counterpart to the "right turns only" design of modern superhighways. ●

This article was adapted by Naval Research Review from a paper presented by Dr. Richard Trumbull to the Aerospace Medical Association last spring. Dr. Trumbull, the Director of the Psychological Sciences Division of the Office of Naval Research, obtained his PhD degree from Syracuse University and holds a limited commercial pilot license. His exposure to aviation began in 1939 as a ground instructor in the Civilian Pilot Training Program. He spent two periods of duty as an Aviation Psychologist in the Navy (1943-46), (1951-53) and has been with the Office of Naval Research since 1953.

You Write The Caption

Surely the people gazing mournfully at this machine have problems. And no doubt they're saying something about it. Maybe the craft is scheduled for the next launch or the deck has to be respotted. Or, could the old chief be recalling how rugged they used to build-em?

However you see the situation *you write the caption!* Send it (or them) to APPROACH. And while you're writing, include your favorite safety suggestion.

Stranger Than Fiction

The TF-9J (F9F-8T) pilot heartily endorses his squadron's SOP of wearing the mae west on all hops—he ejected over the desert and landed in a lake!

The pilot ejected through the canopy at an altitude between 10,000 and 12,000 feet above topography in a nosedown spin.

"I was conscious of a terrific blast and the shock of the seat leaving," he recalled later. "When the face curtain was released it floated quickly away from me. Then I was conscious of tumbling and was snapped upright by the opening shock of my parachute. My watch indicated 0915.

"Don't believe I had been stabilized in the seat over 5 to 10 seconds before the barometric device released me from the seat. Suddenly I found myself in an open chute, one panel of which was split. The drogue gun piston and drogue chutes were hanging down through the split panel. I drew out my survival knife, located on my right lower leg, and cut off the piston which was just above my head. Below me I could see the fire where my aircraft had gone in and saw a lake slightly off to one side. Just in case, I rocked back and withdrew my life raft lanyard attaching it to my mae west. I seemed to be clearing the lake at this point and to be headed for a high dam at one end.

"As I descended, a shear wind evidently caught me for I started drifting back to the lake and it became more and more evident that I was going for a swim. As I discovered I could discern individual weeds in the water, I rotated my quick release box and struck it sharply as my feet hit the water. I do not think I went under very far. I found myself floating face down in the water, the seat pack tending to hold my posterior up and my head underwater.

"I had to manually unhook the leg straps which allowed the seat pack to rise behind me, then disentangled my right arm from the risers and inflated my mae west. Next I pulled out and inflated my raft which inflated upside down. Tried once to right it and since it did not respond readily I climbed aboard as it was. Then I removed my helmet and mask and gloves and set about untangling shroudlines from my legs and boots. My wingman had followed me all the way down and made several passes over me while I was in the water.

"I saw a jeep driving up to the dam about 1000 yards away and yelled but got no results. I got out a dye marker and deployed it in the water. Then seeing the jeep returning down the hill several minutes later, I set off a daysmoke signal which the driver saw. *(The signal was also visible to orbiting aircraft at 20,000 feet.)* The driver, a woman, drove down to the shore about 300 yards away, got in a rowboat and started rowing toward me. She was the lake caretaker's wife. Later she told me she had heard the crash and had seen my parachute descent. In about five minutes she reached me and helped me into the boat. I had injured my back on ejecting and was having a little difficulty but I managed to pull all of my equipment into the boat.

"We paddled the boat canoe style back to the beach and had been on dry land only a few minutes when the rescue chopper arrived. I heard it coming and threw my second dye marker into the lake. Then with the chopper in sight, I used my second daysmoke signal but it fizzled out. The crew saw me, however, and landed a short distance away, then returned me to base.

"I had retained my knee board and issue survival knife through the ejection. The knife was secured to the anti-G suit lining and by an elastic belt. I noted on the descent that I would have lost my right big toe had I not worn steel-toed boots. I had ejected with my visor only partially down which may account for a laceration on the bridge of my nose. I suffered a small, deep cut on my right shoulder requiring several stitches; I suspect that this was caused by a piece of plexiglass while I was going through the canopy. . . The fact that I ejected over the desert and landed in a lake supports squadron SOP of wearing the mae west on all hops."

The pilot's back injury hospitalized him for approximately a week at the end of which he was released to light duty, then to flying.

Besides the chance of encountering water in an over-desert ejection, the mae west should be worn for its survival gear. Items valuable in a desert survival situation are the two Mk13 flares, whistle and flashlight, compass and dye markers.

When in a day situation, if the daysmoke fizzles, the night flare may be used and possibly will be seen.

OVER THE SIDE

In the pilot's account of his rescue after an unsuccessful catapult launch, he points out two mistakes which in his opinion could have proved fatal

After checking the aircraft engine instruments, flaps and trim setting I saluted the catapult officer and braced myself for the launch. As the catapult fired, the aircraft swerved about 40° to the port and I realized that I was going over the side of the ship.

The aircraft struck the water in a left bank of 60° to 90° with the nose down about 45°. Water impact appeared much softer than anticipated and I knew immediately that my legs were free, as the canopy shattered on impact and the cockpit filled with water almost immediately.

After the aircraft had stopped in the water I grabbed the emergency disconnect ditching handle with my right hand and pulled it rather hard, but it did not release me from the seat. Realizing that I might have difficulty in freeing myself I pulled the emergency oxygen bottle toggle with my right hand. Then I pulled the ejection curtain but the seat did not fire. I grabbed the ditching handle with my right hand again and pulled it as far as I could, then grabbed it with my left hand and pulled with both hands until I felt it free me from the seat.

When I was free, I disconnected the oxygen hose from the left console and kicked free of the aircraft. As soon as I was clear, I pulled both of the toggles on my life vest and surfaced in a very short time. (One bladder of the Mk-3C had been punctured by plexiglas.) To my recollection I did not breathe while submerged and was not conscious of any oxygen to my oxygen mask.

When I surfaced, the rescue helicopter was about 100 feet away and proceeding in my direction with his rescue seat near the surface of the water. The seat was brought to within about 5 feet but well out of my reach. I was floating on my back and having considerable difficulty keeping my head out of the water. The helicopter continued hovering rather close by and I thought that the pilot was just having difficulty getting into position for the pickup. Eventually the crewman started getting on the sling and I realized that he was coming into the water to assist me.

At about this time I felt something on my right foot and saw that it was my parachute. (The barometric parachute opening arming lanyard apparently was trapped by some portion of the seat edge during egress and the parachute was deployed.) I began trying to release the chute but I was having so much trouble keeping my head out of the water that it was difficult to release the rocket fasteners. I was using my left hand to protect my face from the spray created by the helicopter. As I was near the point of exhaustion, the crewman from the helicopter arrived and assisted me in releasing the parachute. The helicopter returned and hoisted me aboard. The crewman was then picked up and we were flown to the carrier. . . .

I do not know what I could have done to prevent this accident, but it could have been fatal because of two mistakes I made.

First, I should have pulled the emergency (gas initiator) canopy release handle to get rid of the canopy frame. Although I knew that the plexiglas was knocked out of the canopy frame upon water impact, there could have been enough plexiglas remaining to hamper exiting the cockpit or puncture the flotation gear while getting out. However, had the canopy been removed when the ejection seat curtain was pulled, the seat would have fired and I had just as soon not take that ride unless it was the last available means of getting out of the aircraft.

Second, although the helicopter was nearby when I surfaced, I should have ignored it until after I had released the parachute and survival equipment. By releasing the survival kit, or at least one leg rocket fastener, I would probably have been able to sit in an upright position and would not have exhausted myself in trying to keep my head out of the water.

I strongly recommend that all rescue helicopters be equipped with powered megaphones with which to give the pilot in the water instructions. If I had known that my parachute had deployed when the helicopter first arrived, I could have released it without undue difficulty. After 10 or 15 minutes of floundering around trying to keep my head out of the water, I needed assistance.

Rescue Crewman's Narrative: We had been airborne as plane guard helicopter for about five minutes when I felt the aircraft go into a nose-down attitude and began to increase forward speed. I heard my pilot say, "Get ready down there," then the carrier's voice call for crash on port side of the ship. I released my seat belt after hooking up the gunner's belt and moved to the cabin door where I two-blocked the rescue seat to be ready.

At this time we were over the area of the ditched pilot. Some 40 seconds had elapsed. I could not see the ditched pilot but I lowered the rescue seat into the water to discharge any static electricity as there was a great odor of fuel fumes.

The helicopter made a turn and I spotted the pilot in the water. I gave directions to the helicopter pilot to move up on the pilot in the water, then I noticed the pilot's parachute was deployed. I relayed this information to my pilot and he remained in a hover while I tried to give hand signals to the ditched pilot telling him to remove his parachute. After about one minute I told my pilot that the man seemed to be having trouble so he told me to help him.

I raised the rescue seat to cabin door level and got on, but it lowered a couple of feet and left me suspended as I still had my gunner's belt on. By hanging there I was in a doubled-over position and it forced the safety locking pin into place. This resulted in the pilot having to raise the seat under me and two-blocking it in order to release pressure on the gunner's belt. After releasing the gunner's belt I was lowered into the water. I immediately inflated my life raft and climbed aboard, then started paddling toward the ditched pilot.

When my pilot lowered me into the water I was within five feet of the ditched pilot. However, with his chute deployed I could not go directly to him for fear of becoming entangled in the shroudlines. By the time I was in my life raft and started paddling to him, we were about 15 feet apart as I had been drifting while his deployed chute had acted as a sea anchor. Had I been upwind of him I might have drifted right into the chute and shroudlines before being able to inflate my life raft. This was due to the expert way the helicopter pilot held his position while lowering me into the water.

When I reached the ditched pilot he asked me to help him hold his head above the water. I grasped him by the right shoulder and pulled him up so that his head was resting on top of the life raft. He told me he had been unable to locate the leg quick-disconnects for his chute so he was starting to cut it off with his survival knife. I tried to locate the disconnects but was unable to do so as there was a lot of material bunched up over them. I then used my webbing cutters to cut the shroudlines but it took about 15 seconds to cut through one line so I released them and let them go in the water. Then I took out my survival knife to cut the shrouds. (Both the ditched pilot and I used shark repellent. It was reported later that sharks had been seen in the area.)

Somehow, by the action of the water or something, the bunched up material was moved away from the right-hand disconnect and I was able to release it. Then I turned the pilot around in the water and by pulling on his flight clothing he was able to release the left-hand disconnect. After paddling clear of the chute I motioned for a second helicopter which had been hovering nearby. The crewman lowered the rescue seat and picked up the ditched pilot, then lowered it again to pick me up. It was a very fast and smooth pick up.

Which Is It?

PILOTS often ask—are certain symptoms hyperventilation or an over-breathing syndrome. Here's what the staff Medical Officer of 2nd Marine Aircraft Wing said recently in the USN Medical News Letter.

It has been stated that about one person in ten who comes to a civilian physician for examination has faulty breathing habits. As a result, he suffers discomfort which he or even the doctor attributes to serious organic disease. Symptoms might include dizziness, blurred vision, faintness, palpitations, heaviness in the chest, numbness and tingling of the hands and face, or extreme anxiety and fear.

Most are unaware that they breathe too deeply, yawn or cough excessively, or drag on smokes too rapidly. Try breathing rapidly and deeply several times; you can reproduce any or all of the above symptoms. If at first you don't succeed, try, try again. Then quit—there's no use overdoing it.

Hyperventilation sometimes occurs during oxygen breathing. Remember how a few of your mates were affected during Low Pressure Chamber runs—by apprehension, pressure breathing, etc.? Of utmost important is the fact that this condition could be confused with hypoxia or oxygen lack.

Should there be confusion check your oxygen equipment, but don't breathe deeply. Remember that hyperventilation is due to reduction of carbon dioxide in the body—not too much oxygen. At times, deep breathing or more rapid breathing is resorted to in an attempt to compensate for a shortage of oxygen at high altitudes.

A few words of explanation about the function of carbon dioxide: Breathing too rapidly washes CO_2 out of the blood. CO_2 is a waste gas, and part of the reason for breathing is to get rid of it. But it also performs a useful function in the body. In order to breathe, the body must have a certain concentration of CO_2 to stimulate the brain respiratory center which controls breathing.

You know that it is impossible to hold your breath for an indefinite period. On the other hand, if most of the CO_2 is removed by hyperventilation, the body loses its stimulus to breathe. When this happens, the individual stops breathing until enough CO_2 accumulates in the body to again "trigger" the system.

Staff Medical Officer, Headquarters, 2nd Marine Aircraft Wing, USN Medical News Letter, Vol. 39, No. 12

Sound Damage Problems

What noises create the most ear damage? According to a recent Medical Newsletter, "High tones and extremely low tones are judged universally to be more irritating than those in the middle ranges. Interrupted noises or discontinuous tones are generally found to be the most annoying. In general, any noisy environment will possess a certain nuisance value and will contribute to the production of fatigue and the ensuing loss of efficiency.

"Although it is true that sustained exposures to the noise levels

and frequencies found in the aircraft will result in a period of hearing loss followed by complete recovery, the psychological impact of the noise may be far more dangerous than the physiological effect.

In jet operations, most of the high intensity, high frequency noises are encountered during the period immediately prior to takeoff. In piston engine aircraft however, the pilot is exposed to prolonged periods of relatively high intensity noise. Frequent voice communication by radio in such environments is generally considered to hasten the onset of fatigue. During the course of such a flight there may be a gradual decrease in auditory acuity which will necessitate an increase in the volume level of radio equipment during the latter stages of such flight. —*NavTraDevCen 1339-28-2.*

Hatch Hits Helmet

In a P2 (P2V) ditching the pilot was unable to open his emergency exit hatch with his right hand. The copilot came to his aid and pulled on the handle with both hands. When the hatch came open it hit the pilot on the front part of his helmet and stunned him for an instant. His helmet definitely prevented head injury.

Hand Burns

TWO of the three survivors of an aircraft which ditched after an explosion and severe fire have some words on gloves worth considering:

Radar Navigator: "If my gloves had been on, my hands would have been 99% better but I didn't have them. I had lost them a couple of days earlier."

ECM Operator: "I didn't have gloves on. They were stolen from me two days before. I was using an old mangy pair but even if I'd had those on, I wouldn't have gotten burned so bad."

Both men had second and third degree burns of the hands requiring skin grafting. The pilot who wore gloves received only minor burns of the left hand which were well healed 14 days after the accident. All three men's flight suits, though charred, helped prevent severe body burns.

The pilot in command must ensure that all crewmembers have the required items of protective gear with them prior to flight. Squadron doctrine specified that gloves are to be worn in the aircraft.

Shark Repellent

The shark's sense of sight, in fact, is the target of what appears to be the only effective, although not universally practicable, shark repellent, the discovery of which was an inadvertent by-product of the wartime experiments with decomposed shark flesh and copper acetate.

In some of these experiments nigrosine dye was added to the other ingredients. The repellent incorporating the dye was found to be effective against many species of shark. Indeed, the dye is effective entirely by itself. If an open bottle of nigrosine dye is placed in a circular tank with a free-swimming shark, the dye will gradually diffuse through the water, coloring it black. As the dye spreads from the center, the shark alters its pattern of swimming to avoid the dark area, restricting its movement to the spots that remain clear. By the time the dye bottle is completely empty, the shark has been penned in a small, crescent-shaped segment of the tank, near one side.

This effect is not produced by the smell of the dye; a shark with plugged nostrils will also avoid the dyed areas of the tank. If, however, a shark is fitted with opaque eye shields, it will swim straight through the dyed water. *Perry W. Gilbert, "The Behavior of Sharks"* Scientific American, *July, 1962*

Not His Day

DURING parachute descent after ejection, an A-4 (A4D) pilot erroneously unfastened *both* the hip rocket jet fittings holding his seat pan to his torso harness. The only thing which prevented the loss of the seat pan was the fact that his oxygen mask was still attached to his APH-5 helmet by the Sierra fittings and the hose connected to the bailout oxygen bottle.

He pulled the seat pan to him and released and inflated the raft which he dropped to the water some 50 feet below. He lost the raft because he had failed to hook the lanyard to his torso harness during descent. The survival pack separated from the raft; apparently it had not been fastened to the raft assembly when the equipment was packed.

On entering the water, the pilot grabbed both shoulder rocket jet fittings. He unfastened the left fitting but was unable to get the right one unfastened. In an earlier morning flight, he had had some trouble unfastening the fitting but had not reported his difficulty. His parachute dragged him through the water toward sheer cliffs where waves 15 to 20 feet high were breaking. Just in time, he got the fitting open and his parachute collapsed.

After inflating his life vest and swimming away from his parachute, he was able to retrieve and board his life raft. He had been in the water 30 minutes. After signalling with his Mk 13 flares, he was rescued by helicopter. ●

FOD Flim Flam

You Can Win With...

PROGRAMS & PROGRESS

If you have responsibility for any kind of jet engine—you have had the problem of foreign object damage (FOD) and have felt the impact on readiness, flight time, scheduling, hardware availability and budgets due to premature removals and rejections of engines for FOD. You have probably had a kind of sick feeling when you saw a powerful jet engine rendered useless by FOD because of inadequate prevention or pure neglect. You will be interested in this brief summary of a five-month program which resulted in 13% reduction in removals and 40% reduction in rejections of engines for FOD. If continued, this progress in reduced rejections based on overhaul costs alone can save approximately $1,500,000 annually. This does not attempt to reflect the benefits of aircraft readiness and the cost and time saved on removals, engine prep-to-ship packaging and transportation.

FOD is unnecessary waste. The loss of any jet engine for this reason is considered unacceptable and every effort should be made to reduce these losses to a minimum.

On August 1, 1962, the Large Jet Engine Department of the General Electric Company, in cooperation with U. S. Navy activities, initiated a program to define the problem areas on FOD in J79-powered Navy aircraft installations and take action to reduce FOD rates. Let's look at the approach to the problem, the findings, and the action taken. Perhaps these will be of benefit in your prevention program.

By J. D. Measelle
Large Jet Engine Department
General Electric Company

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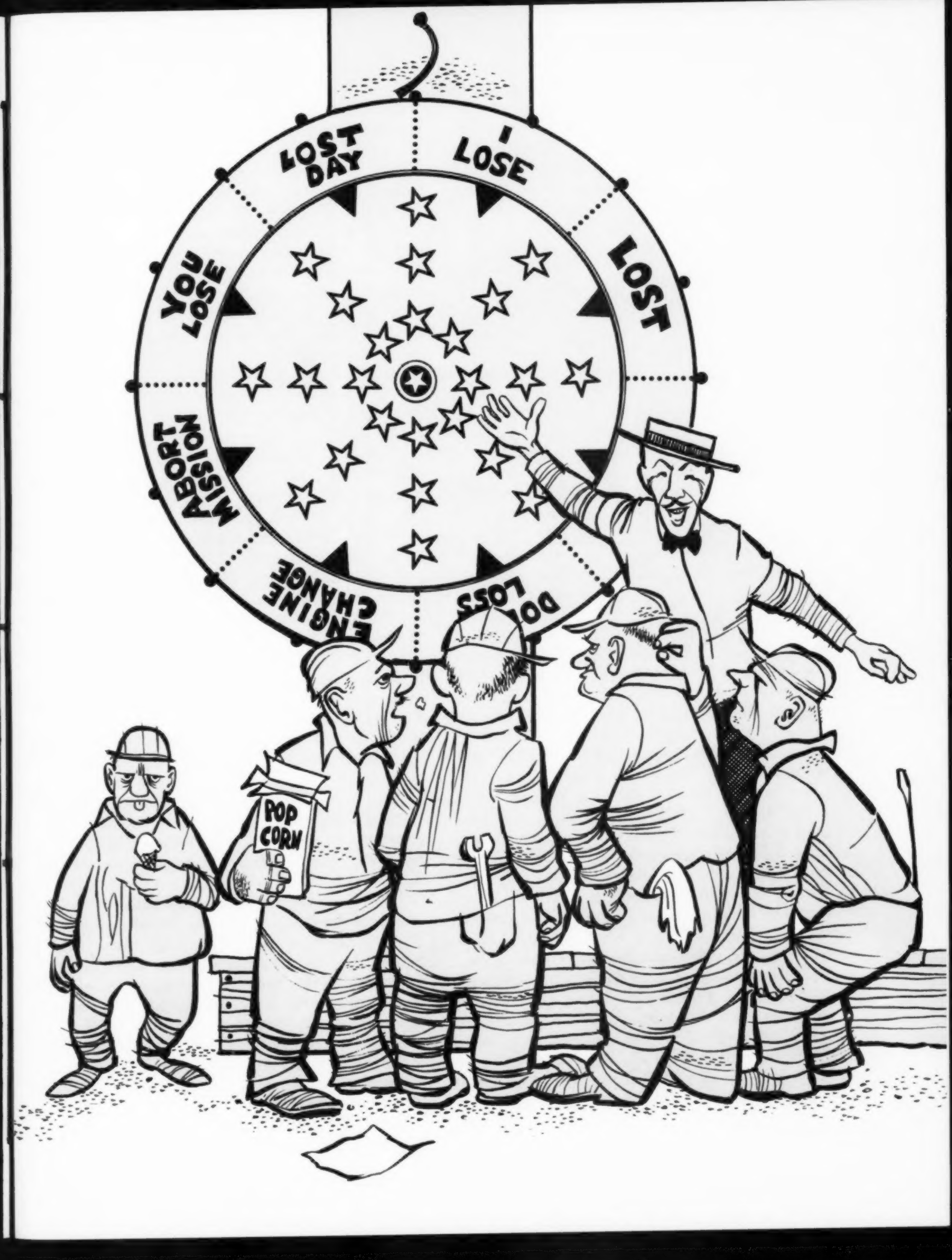

LOST DAY
I LOSE
LOST
YOU LOSE
ABORT MISSION
ENGINE CHANGE
DO LOSS
POP CORN

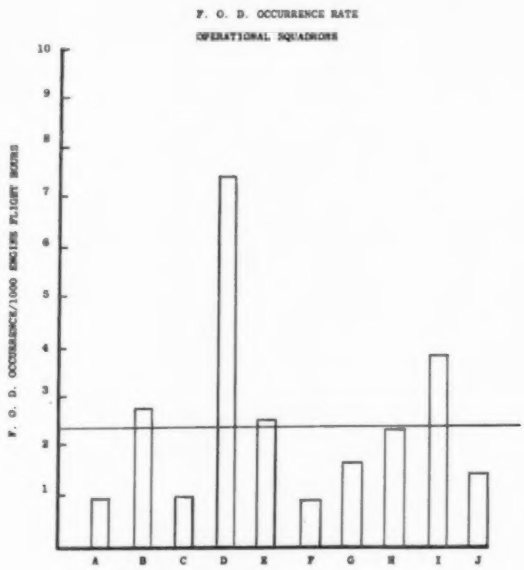


Figure 1

Approach

The first step taken was to review FOD field data to determine potential problem areas for evaluation on trips to the operating activities. Fig. (1) shows a plot of FOD occurrence rates (any incident of FOD) by squadrons. Squadrons "D" and "C" and Squadrons "E" and "F" use the same model aircraft and the same engine. Yet "C" was 8 times better than "D" and "F" was twice as good as "E" even though, in both cases, the same ramp and taxi areas were used. The only major element not the same was the people involved—indicating a problem may exist in maintenance and housekeeping practices.

The same kind of plots were made for engine removal and rejections (base to overhaul) that resulted from these occurrences and similar variations were noted. This indicated a potential problem in using and understanding FOD compressor blade limits. It was also noted that the average activity was rejecting about 50% of the occurrences. Some activities were rejecting as high as 100%. This tended to verify a problem with FOD limits or perhaps effective accomplishment of cold section repair.

Following this study, field trips were made to 22 activities to review the program.

Findings

Field Prevention Programs: Good maintenance and housekeeping practices were generally accepted as the key to prevention. This is probably the most obvious conclusion in every FOD prevention campaign, but is so true it must be re-emphasized. During the G. E. review, it was felt that distinct differences in attitudes, initiative, prevention programs and program management existed between "low FOD rate" activities and "high FOD rate" activities. At the activities with "low rates," it was generally noted that all personnel contacted were aware of the problem of FOD and the local programs for prevention. Prevention programs were more specific and implemented on a formal basis, i.e., "sign off" sheets, schedules for compliance and assigned responsibility. Duct covers and screens were used conscientiously. Duct covers and screens were used in the hangar in addition to the ramp area to prevent the duct from being used as a shelf and to prevent articles from being thrown or dropped in the duct. Ramp and taxi areas were maintained in good condition. These significant items were not evident to the same degree at activities with "high rates."

In relating this field evaluation to the actual data—*The "low rate" activities had approximately one-seventh the removal rate and one-fourth the rejection rate of the "high rate" activities.*

Overall it was recognized that a more detailed FOD prevention program could be beneficial. Material was collected from all activities and evaluated. The best features of all were published in a G. E. brochure "FOD Prevention Programs" dated 1 October 1962. This brochure has been endorsed for guidance in FOD prevention by BuWeps, ComNavAirLant and ComNavAirPac. In addition to overall prevention programs, the brochure specifically covers detailed prevention effort on the A-5 *Vigilante* and the F-4B *Phantom II*. This brings up another key point:

Know Your Installation

Installation Factors: The F-4B (F4H-1) and A-5A (A3J-1) are high performance supersonic weapon systems. In order to achieve efficient performance in any aircraft it is necessary to insure air handling compatibility of the aircraft induction system and the engine. At the high Mach numbers attained by these aircraft, the engine airflow requires variable geometry in the aircraft induction system to achieve compatibility with the engine for best performance. These induction system variables are accomplished with the variable duct inlet ramp, the secondary flow bypass bellmouth and auxiliary air doors. These kinds of

variables are not unique to the A-5A (A3J-1) and F-4B (F4H-1) J79 engine installations. Any aircraft with Mach capability above approximately 1.5 would have similar requirements.

With regard to FOD Prevention, however, these design features present additional problems because of the natural access they offer for foreign objects to reach the engine inlet from other areas of compartmentation in the aircraft; i.e., behind the ramps, behind the gap and in the engine bay area.

In addition, the J79 engine has an aerodynamic, convergent-divergent jet nozzle. The aerodynamic feature requires significant airflow through the secondary nozzle to accomplish high performance nozzle

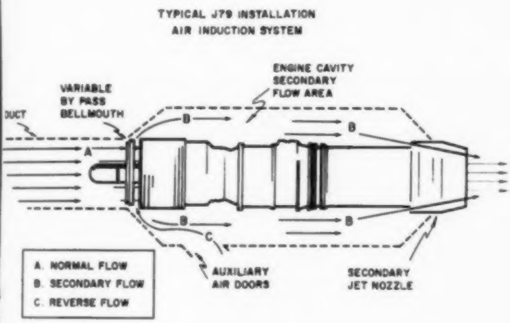


Figure 2

operation. (See Fig. 2). This air is obtained from the inlet duct through the variable by-pass bellmouth. With this feature there is obviously a direct path between the engine compartment and the duct/engine inlet. At low approach speeds in flight and during ground run-up, the secondary flow can be reversed. Air then flows through the auxiliary air doors, the engine compartment, the bellmouth, and into the engine. The engine then becomes a vacuum cleaner for the engine bay area. It is therefore most important that the engine bay and the engine be kept thoroughly cleaned of foreign objects.

At McDonnell and North American, design, manufacturing, and quality control action had been taken. Design changes were made to seal off aircraft compartments from the variable ramp area and engine bay. As an example, sealants and screens were installed around fuel lines entering the bay. In Manufacturing, sub-assemblies would be rotated and shaken to remove loose material. Quality Control used checklists to insure that prevention action had been taken. Another point to reemphasize: *prevention is all-hands responsibility—from design to the flight line.*

Another good point to mention and remember. Loose material left in the engine bay or airframe may be lodged or hidden, but will not remain that way. Once the engine is started and the aircraft makes maneuvers, these parts work free and can move through the airframe and bay and into the engine. Inspect thoroughly, use lights, mirrors and vacuum cleaners. Remember the old adage: "An ounce of prevention is worth a pound of cure." Here's an example:

> On a recent F-4B (F4H-1) squadron deployment, the FOD incident rate was reduced to one-tenth the rate on the previous deployment of the same squadron primarily by keeping the engine and engine bay clean and by inspecting for loose material through the engine access doors after flights.

Compressor Blade FOD Limits: Overall, the field study indicated that the limits in the field manuals were not as clear as they could be. The need for interpretation would lead to unduly conservative decisions on serviceability and field repair. It was also felt that the limits were not being applied properly. Several engines were found at the O&R's within field limits. Corrective action was taken and the limits presentation in the manual was clarified. This was accompanied primarily by use of more visual aids as shown in Fig. 3. In order to expedite compliance, the revision was issued by BuWeps approved Engine

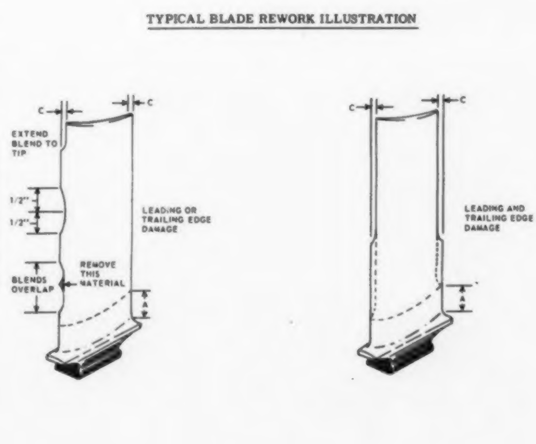


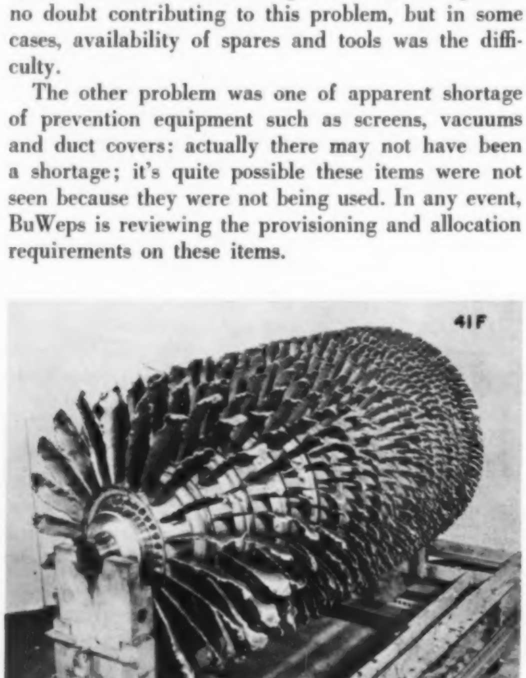
Figure 3

FOD prevention pitch spurs program of VT-22 at NAAS Kingsville, Texas.

Bulletin 163. A field reeducation program on FOD limits was conducted by G. E. factory personnel. Reeducation is effective in both basic orientation on limits and serves as a good reminder on FOD.

Field Maintenance and Prevention Equipment: Two other problems were noted. Cold section repair did not appear to be fully implemented for effective field level maintenance. Budget and scheduling were no doubt contributing to this problem, but in some cases, availability of spares and tools was the difficulty.

The other problem was one of apparent shortage of prevention equipment such as screens, vacuums and duct covers: actually there may not have been a shortage; it's quite possible these items were not seen because they were not being used. In any event, BuWeps is reviewing the provisioning and allocation requirements on these items.



J-79 rotor damaged by ingestion of tools during test cell run—tough but rough.

Summary

After defining the problem areas and action plans, the complete program was reviewed with all field activities. Some 700 people were contacted during this effort.

Relative to July 1962 rates, October and November 1962, rejections were reduced 40% each month. It is interesting to note that these reductions were realized before complete formal implementation of the engine bulletin on limits; the brochure on prevention; and the field review of the final program. Therefore, even more progress can be expected in the future. It would certainly appear that FOD can even be reduced through informal and objective discussions of the problem and subsequent implementation of local corrective action plans.

It is also interesting to note that the potential problems anticipated as a result of the data analysis in the approach to the problem actually existed in the field to some extent.

Prevention in the field is a significant part of the total effort on any FOD program. Let's recap some key actions.

- Establish detailed prevention programs.
- Be specific on your particular aircraft.
- Define responsibility.
- Implement formally (what and when).
- Use check list.
- Analyze data—(predict problems and measure results).
- Educate frequently.
- Report problems, corrective actions, and progress so others may benefit.

This is not "The End"—But, hopefully it is the beginning of progress toward reduced FOD rates in the future.

Psssst

THE PAST few months have brought about an alarming increase in landing gear failures on both coasts. The majority of the failures that are reported have occurred aboard carriers; however, a significant increased failure rate is developing at shore stations too.

Investigations that are presently underway by BuWeps and contractors indicate that design, pilot technique and servicing error are all contributing to the problem. Of these, we maintenance people are in a position to help lick the problem in the area of proper landing gear shock strut servicing.

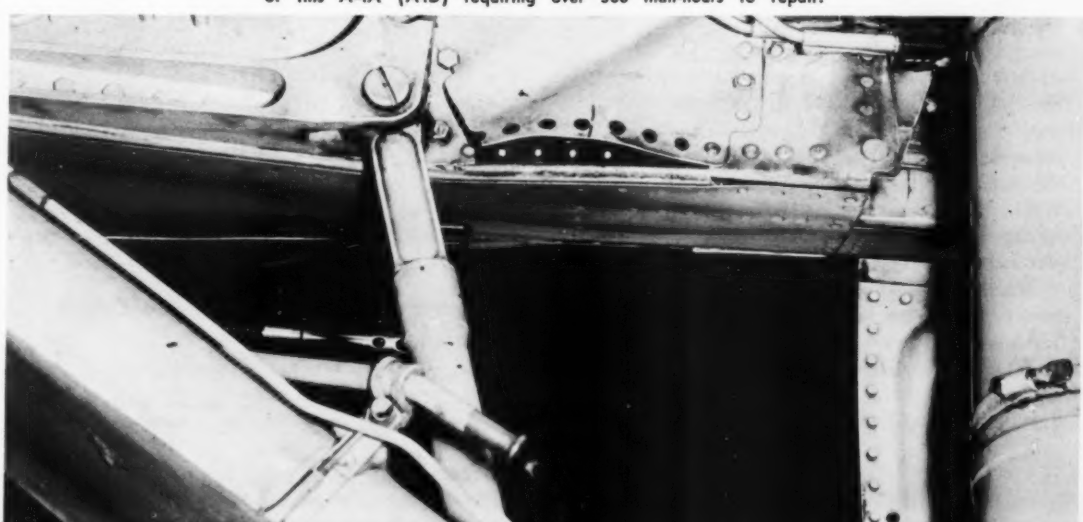
There are few maintenance jobs that are more inviting or susceptible to short-cutting than shock strut servicing . . . and more difficult to detect from outward appearance. A strut that is low on hydraulic fluid *can* be made to look as good as gold with a sneak shot of air or nitrogen when nobody's looking. No jacking the bird up or cycling the gear required . . . just a couple psssst psssst from the compressor or the bottle and you're finished and back in the warm line shack again. No questions from the next pilot . . . it looks good so it must be good and "away we go!" Result? Who knows. Maybe we'll luck out on this one and it will hang on 'til next check, *but* this could be the hop sometimes written up by pilots as "landed a little harder than usual." If that's the case this time the odds in favor of a gear failure really soar!

Let's consider why proper strut servicing is so important. The landing gear shock struts are designed for each type of aircraft to support precalculated loads under certain conditions. These load limits are based on the assumption that the shock strut air fluid ratio will be maintained as specified by the manufacturer. On most of our aircraft this data is displayed on a plate attached to the strut. These instructions and air-fluid ratio values are the only ones that will ensure a correctly serviced strut. Too much air pressure—a "hard" strut that transmits excess landing loads to the gear attach points. Should both the landing and the strut be hard enough another AAR is in the making.

This subject has been bandied about for years and years at all levels of command. People have been instructed, begged and threatened to ensure proper servicing but the fact remains that improper servicing still is occurring and landing gears are still coming apart as a result. Check your Weekly Accident Summaries for the past 2 or 3 months and note the number of landing gear failures we have had on various types of aircraft—pretty demoralizing isn't it?

There is only one solution to the problem. Review the *correct* servicing procedures and re-emphasize the critical need for all hands to treat each strut servicing job with utmost caution.—*NASC Crossfeed*

Overinflated strut caused damage upon retraction of nosegear of this A-4A (A4D) requiring over 300 man-hours to repair.



MURPHY'S LAW*

* If an aircraft part can be installed incorrectly, someone will install it that way!

Reversed Rudder Trim —A-3B (A3D-2)

UPON launch I immediately began having trouble trimming the ball in the center. After 10 minutes of unbalanced and uncoordinated flight (worse even than usual), I guessed that the rudder trim was working opposite to the direction of the rudder trim knob movement, even though the trim indicator followed knob movement.

After landing it was determined that when the trim knob was turned right, the indicator moved right and the trim tab turned right giving *left* rudder trim.

Recommend that *maintenance* and *quality control* people:

- Always refer to the HMI* when changing or reinstalling parts;
- Always functionally check control systems after maintenance.

Contributed by LCDR Frank Scott, VAH-6

* Concur with the recommendations but there are discrepancies in both the IPB and HMI which can lead to confusion in assembly of this part. While it is impossible to connect the rudder trim actuator arm with the cam installed in accordance with the IPB (Fig. 1), lineup of bench marks in accordance with the HMI, NavWeps 01-40ATD-22, Rev. of 1 April 1962, Fig. 285, p. 2-222 is not possible either because the marks stamped on parts (Fig. 3), are not the same as those shown in the HMI. However, other guidelines in the HMI can lead to correct deductions for proper installations.

Thank you, LCDR Scott for passing along the word. Here's a reminder: Errors and omissions such as these should also be reported by FUR as per BuWeps Inst. 5600. 18 of 3 Dec. 1962.

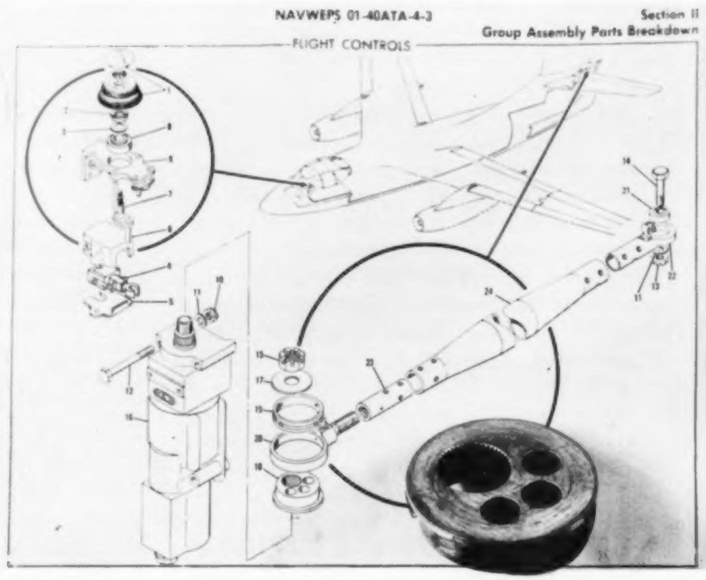


Fig. 1—Comparison of photo of cam superimposed upon IPB diagram shows the cam, item 18, incorrectly drawn—note counterbalancing holes and flange positions.

Fig. 2—Cam installed 180 degrees off on rudder trim actuator.

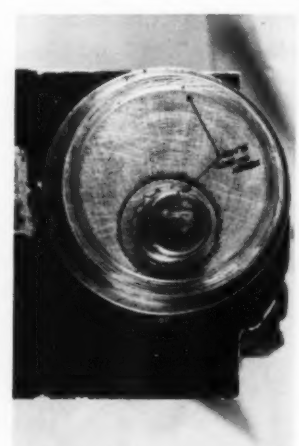
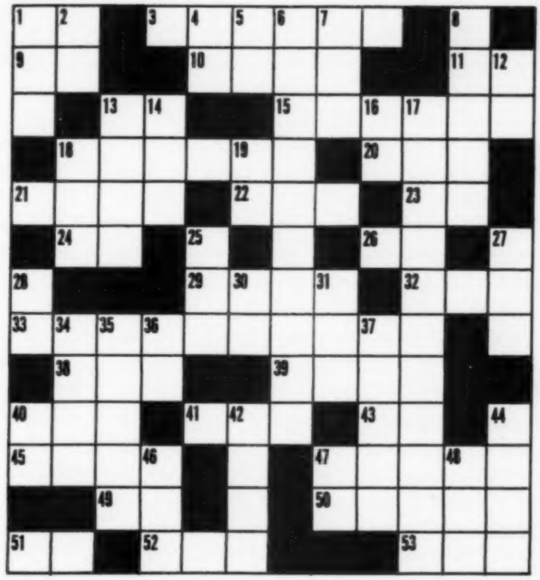


Fig. 3—Cam installed correctly on rudder trim actuator



Across

1. Helicopter Transport*
3. "ALFA" Damage
9. Part of Flt Surgeon's title*
10. All (Latin)
11. From
13. WWII German Interceptor*
15. EVERYBODY'S full-time job
18. Aviation Formation
20. Not applicable
21. MARINSTRUTRAINRON*
22. Ordnance (abbrev.)
23. Automobile Corporation*
24. Not required in DRONE acft*
26. Twice (prefix)
29. Shock troops*
32. Type of insurance
33. A MUST for Plane Commanders
38. Rodent
39. Negative answer (Colloquial)
40. Indicated Airspeed
41. Synonym for EGT
43. Travel chit
45. Groom (India)
47. Country in WestPac
49. Car, not a ragtop*
50. Office of 31 down
51. Command pilot
52. Measure of command experience*
53. "Old faithful" for IFR approach*

Down

1. MARHELITRANSRON (old*)
2. Initials of MajGen Mangrum, USMC
4. Organization Table*
5. Unit of issue for paper*
6. Blind flight
7. Notation for war dead*
8. Notice to Airmen
12. Comptroller's calendar*
13. Publications for aviators*
14. Sum of good humor and common sense
16. Initials of a former president
17. A section of Aircraft Maintenance
18. Tactical part of 29 across*
19. Exclamation
25. Report submitted by 17 down*
27. Non-Radar instrument approach*
28. Cousin to 4 down*
30. Spanish affirmative
31. G. W. Anderson*
34. Non destructive testing device
35. Hebrew word for "Passover"
36. Among Caesar's last words
37. Cockpit trainer for a hot pilot*
40. Exists
42. Left
44. Jargon for coffee
46. Approximate landing time*
47. Skipper*
48. Required for SECRET clearance*

*—denotes abbreviations

See answers next page

Contributed by SGT R. L. Bachstein, USMC
Aviation Supply and Clerical School
NATTC Memphis

Confuzed

Function: Fire-power demonstration.
Location: Bombing range.
Activity: Aircraft skip-bombing run.
Agency: Bomb fragments.
Extent of Injury: Fatal injuries to aircraft crew.
Details of Occurrence: A fire-power demonstration had been planned for showing the effectiveness of low-level attacks. The aircraft was loaded with .50 caliber ammunition, fire bombs, 2.75 FFARs and GP bombs.

A successful fire bomb run and a strafing run were completed. Then the aircraft approached the target on the skip-bombing run. The bomb-bay doors were open, and the bombs were observed leaving the aircraft. At the instant the bombs struck the ground, a detonation occurred, and a fireball reaching from the earth to the aircraft developed. The aircraft caught fire in at least two places, continued on its path, reaching an approximate altitude of 200 to 300 feet, and then crashed. The crash was determined to be the direct result of this bomb-fragment damage.

Investigation revealed that improper type tail fuzes had been assembled to the bombs. The primer detonators used in these bombs had a twenty-five thousandths second delay (0.025 second).

Because of the short period of time between determination of the requirements for the bombs and the scheduled date of the demonstration, the bombs were

requisitioned by telephone as complete rounds, which means all the equipment including fuzes and primer-detonators required to make the bomb operational. The Commodity Manager who received the telephone requisition was not informed as to the intended use of these bombs and directed shipment of complete rounds. The bombs were shipped with tail fuzes and primer-detonators.

The exterior of the wooden box which contained the fuzes and primer-detonators was not properly stenciled with the delay time of the primer-detonators. The metal inner cans were stenciled, but the paint was rubbed off in places and difficult to read. Some cans did, however, have the figure 025 visible, without the decimal point.

The armament personnel who assembled the fuzes to the bombs were inexperienced in conventional bombs and fuzes and misread the delay to be a 25-second delay. They did not have an SOP or a check-list. The proper manuals were not available for checking the type of fuzes or primer-detonators. Shipping personnel did not correct deficiencies in marking of exterior containers or stenciling of inner metal containers. Receiving personnel did not correct these deficiencies.

This accident could have been prevented at any one of several points. Had the requisitioning personnel specified that the bombs were to be released from a low flying aircraft, it is reasonable to assume that somewhere along the line someone would have recognized the danger of using .025-second delay primer-detonators.

If the shipping personnel had been informed of the type of mission they would not have furnished this delay primer-detonator. *If* the shipping personnel had correctly stenciled the outer container and the inner containers with the delay of the primer-detonator the accident could have been avoided. *If* the receiving personnel had inspected the ammunition items in accordance with T.O. 11A-1-10, a correction would have been mandatory. *If* the armament personnel had been qualified on this ammunition they would not have assembled the bombs with the primer-detonator. *If* manuals had been available, the mistake would have been discovered. *If* an SOP or checklist had been used, or if the armament personnel had been adequately supervised, the accident could have been avoided. Accident Cause: Personnel error. The infinitesimal amount of explosive (about 16/1000ths of an ounce) in this primer-detonator was coupled through human error into progressively greater explosive components.

Recommended Preventive Action

- Operations plans should be developed completely to specify the type of mission planned. The Supply and Logistics annex should specify the type of air-munitions items required by Federal Stock Number and complete nomenclature. The operations planner should closely coordinate the mission planning with the armament officer. Planning should be completed in time to allow normal requisitioning or air munitions items by Federal Stock Number and nomenclature.
- The shipping and receiving inspections should be performed on air munitions items in accordance with the provisions of T.O. 11A-1-10, and related directives.
- Only fully qualified armament or ammunition personnel should be assigned to duties requiring receiving, inspecting, storing or assembling air munitions items.
- Pertinent manuals should be available.
- A Standing Operating Procedure should be prepared and approved.
- A check list should be prepared from this SOP to insure proper compliance.—*USAF Air Munition Letter*

Hurry . . .

DURING the initial phase of rotor engagement the helicopter swayed violently. The copilot saw one

1 H	2 R		3 S	4 T	5 R	6 I	7 K	E		8 N	
9 M	C			10 O	M	N	I			11 O	12 F
R		13 F	14 W			15 S	A	16 F	17 E	T	Y
	18 F	L	I	G	19 H	T		20 D	N	A	
21 V	M	I	T		22 O	R	D		23 G	M	
	24 F	P		25 F		U		26 B	I		27 I
28 T				29 U	30 S	31 M	C		32 N	S	L
33 E	34 X	35 P	36 E	R	I	E	N	37 C	E		S
	38 R	A	T			39 N	O	P	E		
40 I	A	S		41 T	42 P	T		43 T	R		44 J
45 S	Y	C	46 E		O		47 C	H	I	48 N	A
		49 H	T		R		50 O	P	N	A	V
51 C	P		52 A	C	T				53 G	C	A

rotor blade spin around its lateral axis and the aircraft was shut down immediately. The pilot and copilot had not thoroughly preflighted the helicopter. They did not see one horn locking pin turned out of the horn assembly and wired in that position. The crew chief did not insure that all horn locking pins were fully seated prior to safety wiring them.

The board commented that haste when applied to a mechanic's work or a pilot's preflight procedure almost always results in certain disaster. In this case the pilots neglected to preflight the rotor head prior to engagement. The rotor blade spun on its lateral axis incurring undue stress on the blade and rotor head. The rotor head and blade were replaced.

Mishaps of this type cause unnecessary overburdening of maintenance personnel and loss of aircraft utilization. It is the recommendation of the board that the importance of proper preflight procedures be stressed under all conditions. Neglect in these procedures can be costly in lives and equipment. Crewmembers and mechanics should be continually reminded that thoroughness is one of the most important parts of their jobs.

This incident is an excellent example of what haste and a feeling of urgency can produce. The pilots in this case were members of a 17-plane launch on an assault mission. Immediately after takeoff they experienced primary servo trouble and returned to the line for a replacement aircraft. The copilot preflighted the replacement aircraft while the pilot signed the yellow sheet (an accepted practice in this squadron) and up to this point were money ahead. But, upon finally stopping the rotor and a tally taken the balance sheet showed: a loss of professional standing among their contemporaries, loss of manhours needlessly, an unnecessary waste of money and material and lost aircraft availability.

The recommendation of the board, as stated, is concurred with additionally, the sense of responsibility must be instilled in *all* personnel who are involved in the evolution of preparing an aircraft from a static to an inflight condition.

Routine?

OUR leading actor in this tale had strapped the A-4 (A4D) to the pilot, removed the ladder, inserted the probe and waited for the GTC to roll up—all routine—why, he had been doing this for darn near a year and a half, and at least for an average of 10 hops per day.

Yep! routine. In the daily routine of everyday operations. Everyone on the line knows what to do and how to do it—but today—Gomen. Somebody goofed, slipped out of the routine.

The method of dispatching a bird went along OK in the sequence of events until the air hose was attached to the starting probe.

The hose was attached by our hero, *but* he failed to attach the safety strap. (Strike 1.) Our supporting actor (the man on the GTC) then came into the scene. He saw the hose attached, and he saw the man wave his arm. Ah ha! a signal to crank it up, or, just some plain ole flapping?

Must have been a signal to pass on to the pilot—so he passed it on (Strike 2). Our man at the starting unit next did not alert or caution the man at the probe that he was living dangerously by remaining where he was, nor did the pilot observe that the man was not clear prior to pushing the starter. (Strike 3.)

At this point the ball game was over. Three strikes is all you get in any man's ball game. As air pressure built up, the hose slipped off and our intrepid plane captain caught a 51 PSI punch right on the kisser. This was *not* routine. (Lucky fella—only delta injury.)

Once again, "Familiarity breeds contempt" remains a true statement. Around the flight line nothing is more dangerous than familiarity, and nothing should be considered as routine.

Let's all stay in the ball game by remembering that safety is everybody's business, and that this can only be accomplished by NOT considering daily operations as routine, but by judiciously following procedures, knowing the rules and playing the game accordingly.—*Contributed by GySgt Barney Contrares, VMA-211*

Asking for Trouble Dept.

AIRCRAFT entered fuel pits with sparks coming from wheel. Squadron personnel stated brakes were not hot. Wheel was glowing after aircraft stopped. Two other aircraft taxied into fuel pits without hot brake checks.

All units are reminded that a fire watch with a CO_2 bottle is required during fueling operations. This man should be stationed in the immediate vicinity of the fuel nozzle. This fire watch is in addition to the man on the nozzle.

—Station Name Withheld

Letters TO APPROACH

Beware the VDS

FPO, New York—During ASW we operate with most of AirLant's helicopter squadrons including HS-3, HS-7 HS-9 . . . , and have nothing but respect and admiration for their ability to carry out ASW missions under some very trying circumstances.

However, we would like to help keep them flying by passing along a comment about safety during routine helo—ship transfers especially with VDS—equipped ships like us. We have noticed (with dismay) that when SH-34G (HSS-1) and SH-3A (HSS-2) pilots position themselves for hover during deliveries, they are unable to see the bail on our VDS ram projecting about 12 feet above the deck at the after end of our fantail.

The VDS bail is the highest point on our stern—several feet above the flagstaff or Mount 53—and unlike either the flagstaff or gun barrels cannot be lowered to assist the low-flying helo pilot. In his normal position, the pilot usually hovers at a 30-degree angle to the ship centerline with his wheels—which he can see—three to five feet above Mount 53, but his tail wheel—which he *cannot* see—comes within a foot or less of the VDS bail!!!

We Destroyermen love to get mail and packages flown in by helo and we wish all of the rotor-jockies in the Navy a long and happy life. So please pass the word to them, keep your tails out of our VDS!

We have missed the last few months' issues. Would you please put us back on your mailing list? We can use the information on survival and survivor rescue for our Plane Guard Training program.

R. G. GROSSE, LT.
Gunnery Officer
USS INGRAHAM

• You are on the list. Thanks for the warning—we do have some messy incidents from time to time during transfer.

Award Winner

Richmond, Va.—A new reward came to us when we received 10 awards in the Virginia State Printers' Association competition . . . plus the prized August A. Dietz, Jr. Memorial Award, given annually "in recognition of fine printing consistent with the highest traditions of Virginia Graphic Arts."

APPROACH received a first place in the "Periodicals" category, large shop classification.

We of course are very proud of this honor and want to share it with you. We know full well that printing excellence begins with the printer's customer. Thank you for giving us this opportunity to produce a winner.

BILL TREVVETT
Trevvett, Christian & Co., Inc.

Hypoxia

FPO, San Francisco—Being a flight surgeon, I find your publication extremely helpful and informative. One of the first things I read are the "Notes From Your Flight Surgeon." When I read this section in the February, 1963 issue on page 36 I was quite surprised about the first incident titled "Hypoxia."

I concur wholeheartedly with the fact that oxygen masks should be inspected and cleaned thoroughly, frequently and regularly. But there was one glaring omission, one that I would consider to be just as important as the conclusions. The pilot of the second plane instructed the NAO to continue flying the aircraft on "the present course." This is definitely *not* the thing to do when an oxygen equipment malfunction is suspected at an altitude greater than 10,000 feet. The NAO should have been instructed to get down below 10,000 feet without hesitation. The result of getting down to this altitude is evidenced by the fact that the pilot regained consciousness while descending through 10,000 feet.

R. W. AKIN, LT, MC
Station Hospital
Navy 955

• You're right—in cases of suspected hypoxia the thing to do is to descend below 10,000′. However, in this instance perhaps an influencing factor was that descent to lower altitude would have increased fuel consumption. As it was, the pilot landed with less than 300 lbs. of fuel.

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request. Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va. Views expressed are those of the writers and do not imply endorsement by the U. S. Naval Aviation Safety Center.

Yukon Survival

Berkeley, Calif.—The two articles enclosed appeared in the *San Francisco Examiner* of March 27, 1963. I am forwarding these as being of interest to APPROACH and to the Safety Center. The articles do not indicate that they

are wire service copy; thus I infer that only the shorter AP or UPI coverage was available to you.

On reading "The Body Fat Basis of Survivals" I could imagine the comments at annual physicals which would run something to the effect of "But Doc, that's not fat. That's my built-in PSK-2!" I doubt "Doc" would be sold, but perhaps one of the doctors would care to add to or rebut the article.

JAMES T. MILLER, LT
NROTC Unit
University of Calif.

• The newspaper articles enclosed with the above letter concern Alaska pilot Ralph Flores and Miss Helen Klaben's remarkable survival for seven weeks in the wilds of the Yukon in weather as cold as 60° below zero. One of the articles, "The Body Fat Basis of Survivals," discussed the fact that the weight reserve of the two enabled them to survive without food for 40 days. Flight surgeons are not sold on "built-in PSK-II kits" for aviation personnel but—seriously—they do agree that pilots and crewmen should find the survival ingenuity and courage of Mr. Flores and Miss Klaben impressive and inspiring. If these two persons could survive such a length of time without food or special survival equipment, Navy pilots and crewmen who are equipped, trained and psychologically prepared for the possibility of such a survival situation should be able to do as well.

Navy Survival Training

Maxwell AFB, Ala.—Currently this agency is conducting a survey of survival training programs in the military services. Our objective is to determine the extent of the training offered, its scope and character, and to make this information available to requesting agencies and individuals. We will appreciate receiving from you information concerning the location and addresses of survival training programs being conducted in the Navy.

PAUL H. NESBITT
Chief, Arctic, Desert, Tropic Information Center
Aerospace Studies Institute
Air University, USAF

• In addition to the basic survival training of approximately 3 days duration given our flight students in their basic preflight school training by Chief of Naval Air Basic Training at Pensacola, all Navy commands conduct survival training based on specific needs of operational units as determined by the commanding officers concerned. An example of this type of training is the survival courses, broken down into 3 phases; parachute, jungle and water survival, conducted by NAS Cubi Point, P.I. consisting of 2 to 3 days per phase.

Three formal survival schools are also employed by type commanders. They are:

(1) Cold Weather Survival School at NAS Brunswick, Maine under the control of Commander Naval Air Force, U. S. Atlantic Fleet and administered by Fleet Airborne Electronic Training Unit, U. S. Atlantic Fleet, NAS Norfolk, Virginia (5 days).

(2) A survival school under Commander Naval Air Force, U. S. Pacific Fleet, NAS North Island administered by Fleet Airborne Electronic Training Unit, U. S. Pacific Fleet, NAS North Island and located at San Diego, California (5 days).

(3) Two similar survival schools under FAETUPAC, one in Hawaii, and one at NAS Whidbey Island, Washington.

(4) A Cold Weather Survival School administered also by FAETUPac (2. above) during the winter months in the mountains northeast of San Diego, Calif. (about 3-4 days).

Film Number Correction

On page 27 of the May 1963 issue of APPROACH, above the article entitled "Destroyer Rescue," reference was made to the training film "Destroyer Rescue of Aviators." The film number should read MN-8760C.

AVAILABLE—This handy reference, listing all major APPROACH articles printed through June 1962, was recently distributed to all Aviation Safety Officers. Non-Navy subscribers may order a copy from NASC.

Ground Support Equipment Lights

Washington, D. C.—In reference to the letter "In the Dark," page 23 of the April 1963 issue. Why not use a green lens?

D. T. WALLACE, LCDR
OP-503E-OPNAV

• See next two letters, please.

FPO, New York—Re April 1963 column "In the Dark." The whole problem of lights and lighting in aircraft parking areas seems insurmountable, because one always attacks it with piecemeal solutions.

Let's admit the environment is bad and change it. "Red Floodlighting with Red or White Dustpan Lighting" is my answer.

P. M. BELISLE, LT
CVSG-59 LSO/SAFETY

El Segundo, Calif.—. . . The two basic requirements set forth in the letter from NAS Lemoore—maintaining adequate red lights for night visibility and recognizing the direction the vehicle is traveling—can be accomplished through the use of bar lighting. Basically, the principle involves the establishment of a pattern of red light to indicate direction rather than the use of the conventional red and white lighting.

The pattern of red light is arbitrary; however, the method we suggest is the use of vertical bars on the front of the vehicle and horizontal bars on the rear. Each bar should be made up of a line of three lights. This would allow the loss of one light without the loss of the bar effect. The front lights could include the regular headlight and a red lens to provide sufficient brillance to allow safe operation of the vehicle.

This method of lighting would require indoctrination of personnel but its simplicity would reduce this indoctrination to a minimum.

R. H. LUKE
Field Support Manager
Aircraft Division
Douglas Aircraft Company, Inc.

NavWeps 00-75-510

approach

THE NAVAL AVIATION SAFETY REVIEW

VOL. 8, NO. 12

Purposes and policies: *Approach*, published monthly by the U. S. Naval Aviation Safety Center, is distributed to naval aeronautical organizations on the basis of 1 copy per 10 persons. It presents the most accurate information currently available on the subject of aviation accident prevention. Contents should not be considered as regulations, orders, or directives. Material extracted from mishap reports may not be construed as incriminating under Art. 31, UCMJ. **Photos:** Official Navy or as credited. Non-naval activities are requested to contact NASC prior to reprinting *Approach* material. **Correspondence:** Contributions are welcome as are comments and criticisms. Views expressed in guest-written articles are not necessarily those of NASC. Requests for distribution changes should be directed to NASC, NAS Norfolk 11, Va. Att: Safety Education Dept., if you are receiving the magazine free because of military or commercial contract status with the Navy. . . . IF YOU ARE A PAID SUBSCRIBER, address all renewals and change of addresses to Superintendent of Documents, Washington 25, D. C. **Subscriptions:** Single copy 35 cents; 1-year subscriptions $3.50; 2 yrs., $7.00; 3 yrs., $10.50; $1.00 additional annually for foreign mailing. **Printing:** Issuance of this publication approved by the Secretary of the Navy on 15 April 1961. Library of Congress Catalog No. 57—60020.

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Our product is safety, our process is education, and our profit is measured in the preservation of lives and equipment and increased mission readiness.

Privileged Documents

The privileged document status of the aircraft accident, incident, flight hazard, ground accident, or medical officer's report is the heart of the Naval Aviation Safety Program.

Its purpose is to permit full disclosure by interested parties and witnesses of all facts concerning the mishap. Since all statements made to the Aircraft Accident Board are privileged, there should be no fear of self-incrimination or disciplinary action. Witnesses are less likely to conceal any information that might under other circumstances adversely affect them, or their careers.

Why do we have privileged documents? It is particularly pertinent to note that aircraft mishap reports, and medical officer's reports can be used *only* for analysis and statistical studies in the prevention of aircraft mishaps. They are deemed privileged documents. As such, they cannot be used as evidence, or to acquire evidence in determining the misconduct or line of duty status of killed or injured personnel; as evidence to determine responsibility of personnel from the standpoint of discipline; as evidence to determine the liability of the government for property damage caused by such mishap; or as evidence before such administrative bodies as an aviator's evaluation board. The contents of an aircraft mishap or medical officer's report, or enclosures, attachments or endorsements thereto, may not be appended to any other report as an enclosure or otherwise, unless the sole purpose of the other report or document is to prevent aircraft mishaps.

OpNav Instruction P3750.6D, Section J, Administrative Procedures, thoroughly covers the policy in regard to distribution and/or release of information from the subject reports. Reports of NASC investigations will be limited to the authorities named in this instruction,. unless otherwise specifically authorized by the Chief of Naval Operations. *Under no circumstances* will relatives of persons involved in aircraft mishaps be furnished information concerning the contents of the subject mishap reports. Requests or subpoenas for information, as well as administrative claims against the government, must be referred to the Judge Advocate General, Department of the Navy, Washington 25, D. C.

It is the policy of the Department of the Navy that no part of enclosures, attachments or endorsements to any aircraft accident, incident, flight hazard, or ground accident report, medical officer's report or report of special investigations of the same, made by the Commander, Naval Aviation Safety Center will be used in any suit or action for damage arising out of the mishap investigated by such report. The release of such report, or of an extract therefrom, would be in complete opposition to the condition upon which the information contained in the report had been acquired: that such report is considered privileged and cannot be made the basis for subsequent legal proceedings. This would lessen the full and free flow of information to those responsibile for such report. This, in turn, would diminish the data available for analysis, with detrimental consequences to the primary purpose of such report: the prevention of aircraft mishaps.

Aircraft mishaps investigators, as well as others directly involved in the Aviation Safety Program, are dependent on the full cooperation of all personnel engaged in the operation of aircraft. Without this cooperation our safety program would fail. To encourage continued cooperation, the privileged status of these reports must be carefully guarded, fully understood, and faithfully honored by all hands. ●

LIFT and DRAG

Waiting For The Next Sequence?

Today or any day is a good time to take advantage of the info in APPROACH. Recent surveys show that some units are not providing sufficient magazine routing for men assigned aircraft maintenance and support responsibilities. Remember, each copy is meant for 10 people. Has your unit distributed APPROACH so it's available to all?